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Fifteenth Annual Meeting of the

Mechanical Division, A.A.R.

O. A. Garber, Chairman

THE fifteenth annual meeting of the Mechanical Division of the Operations and Maintenance Department, Association of American Railroads was held at the Congress Hotel, Chicago, June 25 and 26. O. A. Garber, chief mechanical officer, Missouri Pacific, chairman of the Division, called the meeting to order and, before proceeding with the program called upon the members present to stand a moment in silence out of respect to the memory of W. G. Black, vice-president, Chesapeake & Ohio, whose death, on June 20, deprived the Division of its vice-chairman.

The report of the General Committee was received and approved by a vote of the members present. This report included a review of the events of importance since the last meeting of the Division, a summary of the actions of the Committee and a review of the status of various matters now pending before the Division, or in which it is involved.

In reporting that at a meeting of the Board of Directors of the Association of American Railroads held on March 27, 1936, it was decided that the effective date of interchange Rule 3, Sec. (t), Par. (4), for the retirement of arch-bar trucks, would not be extended beyond January 1, 1938, the committee reported that at the end of last year there remained 568,032 railroad-owned interchange freight cars and 96,624 private line cars, or a total of 664,656 freight cars, amounting to 29.1 per cent, equipped with arch-bar trucks. The committee presented an estimate that approximately 588,500 cars so equipped would still remain in service at the end of June this year.

The committee also reported that 50,420 railroad-owned and 3,079 private line cars were equipped with AB brakes as of March 31, 1936.

The report announced that the Locomotive Service Brotherhoods have completed the presentation of evidence before the Interstate Commerce Commission in their request for an order to require the application of mechanical stokers on all coal-burning locomotives, and that the railroads will start the presentation of their case on July 6. In the rehearing before the commission in connection with a complaint of the locomotive service brotherhoods asking for the application of power reverse gears on all steam locomotives, the committee announced that the rehearing was concluded on March 5 and that a brief for the railroads is being filed with the commission by the general council of the association.

During the opening session the division was addressed briefly by Assistant Chief Inspector Shirley, of the Bureau of Locomotive Inspection, Interstate Commerce Commission, Roy V. Wright, managing editor, *Railway Age,* L. W. Wallace, director, Division of Equipment Research, A.A.R., and A. G. Pack, formerly chief inspector, Bureau of Locomotive Inspection.

Mr. Shirley indicated the importance, in the interests of safety, of having the front cab windows securely fastened with bolts, instead of screws; also the use of shatter-proof glass in these windows. Snow and ice on the windows obscure vision in winter weather. Plenty of heat is available in the cab and measures should be taken to heat the windows and prevent ice forming on them. The engineman's compartment on other than steam locomotives is frequently too cold in winter, and

J. W. Burnett, Chairman-elect

particularly so where metal floors are used. Means should be provided for insuring the maintenance of a reasonable degree of heat in such compartments. Steps should also be taken, he said, by the use of insulation or other measures, to eliminate the deafening noise in the cabs of other than steam locomotives.

In his remarks Mr. Wright congratulated the members of the Mechanical Division on the extraordinary way in which they had met the conditions created by the depression during the past few years. This applied, he said, not alone to the ingenuity with which they had increased the efficiency of their operations, but to progress made in the utilization of new materials and new types of equipment which have recently been developed. Two new challenges now confront the mechanical department officers and supervisors, said Mr. Wright. These are the problems in connection with the speeding up of both passenger and freight service to meet the new forms of competition and the problem of personnel training which the present depleted state of the mechanical-department forces has created. This, he said, required a renewed interest in apprenticeship and building up and educating the supervision within the department. In the latter connection, Mr. Wright expressed the hope that, with a continuance of the improvement in business conditions, next year might see a return to a convention with a large exhibit of the many new and improved features of equipment never before exhibited. This, he said, would afford an invaluable means of education for these men as well as for all railway officers.

L. W. Wallace explained his conception of the primary function of the Division of Equipment Research in developing data and investigating current problems which arise from time to time in connection with railway equipment. He stated that the division, of which he is the head, desires to supplement, and in no way to supplant, the work of the various committees of the Mechanical Division. The Division of Equipment Research has already cooperated with the Committee on Car Construction in connection with impact tests of the Pullman welded steel box car and has advised the Committee on Locomotive Construction regarding two or three proposed studies. Mr. Wallace solicited further opportunities to assist the Mechanical Division committees in securing engineering data, arranging programs of test procedure, developing estimates of cost and in every other way which may prove feasible. Mr. Wallace closed his remarks by outlining the general procedure and program of the present investigation of air conditioning and stated that 23 out of 30 railroads have already assigned special engineers to make an intensive study of railway air conditioning requirements and assist in the road tests which must be made before any final conclusions are drawn.

New Chairman Elected

Owing to the death of W. G. Black, vice-president, Chesapeake & Ohio, whom the Nominating Committee had proposed in its formal report as the candidate for the chairmanship for the ensuing two years, the committee named J. W. Burnett, general superintendent of motive power and machinery, Union Pacific System, for chairman and proposed no candidate for vice-chairman at this time. Mr. Burnett and the following members of the General Committee, to serve until June, 1938, were elected: F. W. Hankins, chief of motive power, Pennsylvania; R. G. Henley, superintendent of motive power, Norfolk & Western; F. R. Mays, general superintendent of motive power, Illinois Central; J. Purcell, assistant to vice-president, Atchison, Topeka & Santa Fe; A. L. Ralston, general mechanical superintendent, New York, New Haven & Hartford. O. A. Garber, the retiring chairman, was also elected to serve on the General Committee during the next two years.

Electric Rolling Stock

The subjects under consideration by the committee include (1) advantages of anti-friction bearings for electric locomotives and m.u. cars, (2) a summary of experience in steam heating of passenger-train cars while being handled by electric locomotives, (3) methods of treating traction-motor windings for protection and preservation of insulation, (4) the Pennsylvania type GG1 electric locomotive, and (5) electric locomotives placed in service during the year ending June 1936.

Anti-Friction Bearings

A questionnaire was sent to 13 railroads believed to have acquired experience with anti-friction bearings, asking what advantages they offered when used in traction motors, main journals of multiple-unit cars and electric locomotives, with respect to operation, maintenance and conduction of current through parts. A brief summary of the information gathered is, as follows:

"1—Anti-friction bearings on armatures have no apparent effect upon starting friction.

"2—When journals are equipped it is general practice to hold trains at stations with brakes where it was not necessary with plain bearings.

"3—There is no apparent difference in running friction and there has been no effect upon schedules.

"4—No energy saving has occurred.

"5—Only one of the four railroads reporting has had any failure resulting from passage of propulsion current through the bearings and no provision has been made for passage of propulsion current around the bearings.

"6—The information on cost of maintenance and the recommendations for the use of anti-friction bearings are not suitable for comment at this time.

"The committee believes there are one or two other roads which have had considerable experience with anti-friction bearings and it shall continue to seek information on this subject with a view to making a final and definite report next year."

Steam Heating and Air Conditioning

Four railroads submitted summaries of their experience in the steam heating of passenger train cars while being handled by electric locomotives. These included the Chicago, Milwaukee, St. Paul & Pacific, the New York Central, the Pennsylvania and the New York, New Haven & Hartford. The report includes the data supplied by the railroads and these data are summarized by the committee, as follows:

"When passenger train cars are being hauled by steam locomotives there is a large source of supply of steam for car heating

V. R. Hawthorne, Secretary

purposes in the locomotive boiler. Also this supply is available at high pressure, i.e., in most cases at around 200 lb. per square inch. Through the use of a reducing valve the desired pressure is supplied to the steam train line. In the past when rubber hose connections were practically the universal standard connection between cars the maximum pressure was limited to about 130 lb. per sq. in., since this was the limit the hose could be expected to withstand without premature failure.

"On electric locomotives it is necessary to have a boiler for the sole purpose of supplying steam for train heating or cooling purposes.

"Since the boiler, its auxiliaries, fuel oil tanks, water tanks, etc., take up valuable space in the cab and add weight, thereby making the layout and design of the traction apparatus more difficult and crowded, it is desirable to limit the size of this equipment, if possible, yet keep it adequate to handle the maximum train demand for heating or cooling without restricting the train length below the hauling capacity of the locomotive.

"The early electric locomotive boilers were built to operate at 100 to 120 lb. per sq. in. At that time many wooden cars were in use, trains were short, the connections between cars were rubber hose, the train line 1½-in. or less in some instances, and the gasket opening 1⅝-in.

"The present practice of the railroads to operate long trains of 16 or 18 cars or more at higher speeds and at the same time provide better conditions in the cars both in heating and cooling has created demands on the steam supply system that have necessitated revisions in its equipment as follows:

1—The use of a 2-in. train line and 2-in. metallic end connections between cars to permit passage of the required volume of steam with the minimum pressure drop.

2—New boilers being built for electric locomotives are designed for 200 or 220 lb. per sq. in. working pressure to provide sufficient pressure at the rear of long trains for steam heat purposes or air conditioning by the steam system, which requires 60 lb. per sq. in. at the rear car for proper operation. Note: For steam heating purposes only a maximum of 8 to 10 lb. has been considered sufficient at the rear car.

3—Adjustment of locomotive regulators to make possible the supplying of steam to cars at 175 lb. per sq. in. or higher.

4—To minimize drop between boiler and rear of the locomotive, pipe larger than 2 in. has been used in some cases.

5—The use of reducing valves on each car to maintain the pressure constant at the regulator, or the use of diaphragms in regulators capable of efficiently handling steam at all pressures from 0 to 200 lb. This to minimize waste of steam and consequent loss of pressure and capacity to heat the train.

6—Boilers of greater capacity are being provided in the electric locomotives now built. Recent ones have had normal ratings of 3,250 and 4,700 lb. of steam per hour from and at 212 deg. F. Under forced ratings twice this evaporation is available.

"The amount of steam required per car per hour varies with the particular type of car, the speed, the weather conditions, the condition of the train line and regulators with respect to leaks, adjustment, etc., and to the difference between the temperature in the car to the outside air. A fair average figure for design purposes for a car temperature of 70 deg. F. with outside temperature zero, and train line in good condition, is 200-250 lb. per hour. The exact value is dependent on the car insulation and whether the cars have single, double or triple windows, etc.

"For air conditioning by steam, about 250 lb. per hour per car is required. Since the outside air temperature is high when this equipment is used, the condensation losses are a minimum.

"It has been found that well insulated metallic end connectors reduce the loss approximately 10 per cent over uninsulated connectors. Aside from the heat economy standpoint this is the equivalent of an increase in boiler capacity since more cars could be satisfactorily handled by the same boiler. Further the water supply which is necessarily limited on electric locomotives is conserved, making possible longer trains or runs.

"Summarizing, it can be said that experience in heating or cooling of passenger trains being hauled by electric locomotives shows that ability to handle long trains is limited by the pressure available at the rear of the locomotive, train-line pressure conditions, and the capacity of the boiler to produce sufficient quantity of steam."

Treating of Traction-Motor Windings

Exhibit No. 3 of the report contained certain conclusions drawn by the Committee as a result of a questionnaire sent out to Committee members dealing with the methods used on electrified roads for the treating of traction-motor windings.

Electric Locomotives

Exhibit No. 4 of the report consists of brief descriptions of the class P5A and class GG1 electric passenger locomotives now in service on the Pennsylvania.

Exhibit No. 5 consists of a table covering electric locomotives placed in service during the year ending June, 1936. These are all Pennsylvania locomotives and consist of two switchers having a C axle arrangement, 27 type P5A passenger locomotives with a 2-C-2 axle arrangement, and 57 type GG1 passenger locomotives having a 2-C + C-2 axle arrangement.

The report is signed by R. G. Henley (chairman), superintendent motive power, N. & W.; J. H. Davis, chief engineer electric traction, B. & O.; J. W. Sasser, superintendent motive power, Virginian; R. Beeuwkes, electrical engineer, C.M.St. P. & P.; W. S. Hamilton, equipment electrical engineer, N.Y.C.; A. L. Ralston, general mechanical superintendent, N.Y.,N.H. & H., and H. C. Griffith, electrical engineer, Pennsylvania.

Action.—The report was accepted and ordered published in the annual proceedings.

Lubrication of Cars and Locomotives

Methods of Lubrication

Tests of various types of lubricators and methods of lubrication have been continued by a number of member roads. Reports received by the Committee so far have not developed anything of sufficient merit to warrant any recommendations at this time. Tests are still in progress and observations will be continued to ascertain definite operating performances.

During the extreme weather of the past winter there was a decided increase in delays to passenger trains on some roads due to hot boxes. Much of this trouble was due to moisture in the journal boxes, causing packing to freeze and roll out of position with resultant break down of lubrication. The past winter has emphasized the importance of and necessity for leak-proof dust guards and journal-box lids.

The present specification for dust guards does not provide a leak-proof guard, and your committee has now undertaken a study to determine the possibility of securing adequate dust-guard and box-lid protection for journal boxes. As various methods of sealing journal boxes are being experimented with by member roads, the committee would appreciate suggestions from members and manufacturers, of any new developments or devices of merit that are now being used or tested.

Journal Bearings

The new design of journal bearing known as the S.B.O.C. (Security Bond Oil Control), developed by National Bearing Metals Corporation, has been tried by a number of railroads and private car lines. Some member roads have requested permission to use this type of bearing in interchange as an equivalent substitute for the standard A. A. R. bearing.

This committee, after investigating the performance of these bearings, feels that they can be accepted as equivalent to the A. A. R. bearings in interchange and recommends accordingly.

Specifications for Reclaimed Car Oil

As a result of recommendation made in the 1935 report, the Committee on Specifications for Materials has reworded Specification M-904-36 and added two paragraphs describing apparatus and procedure for testing for extraneous solids.

This revised specification is submitted for adoption.

Interchange Rule No. 66

Examination of the condition of journal-box packing, bearings and wedges of freight cars, where the work had been performed as required by Rule 66, notably on equipment built during the past two years, indicated that the periodic repacking period could be extended without impairing the service. The Committee therefore recommends that consideration be given to an extension of three months beyond the present requirement of 12 months and 15 months. The extended period will then more closely coincide with air-brake cleaning dates, one repacking period equaling present air-brake cleaning period, and two repacking periods equaling one cleaning period for cars equipped with AB brakes.

There are still member roads and private car lines that use materials not meeting the A. A. R. requirements when repacking owned cars. It is felt that no further improvement in the hot box situation can be expected unless there is a unity of purpose upon the part of all car owners to insist upon full compliance with the requirements of the rules.

This Committee is strongly in favor of adding to Interchange Rule 3 a requirement that all cars in interchange must have journal boxes packed and stenciled in accordance with requirements of present Rule 66 and materials used must meet the requirements of the A. A. R. Standards; and respectfully recommend that the Arbitration Committee give this their consideration.

The question of application of new journal bearings in con-

nection with change of wheels and axles has been considered by the committee and it is recommended that if, in the judgment of repairing line, the old journal bearings may be safely re-used on the journals of axles applied, charge for new journal bearings on such axles is not justified. It is recommended that the Arbitration Committee give this matter consideration.

Renovated Journal-Box Packing

The committee has undertaken a review of present A. A. R. requirements for renovated journal-box packing as now contained in Rule 66, with a view to proposing changes to clarify and tighten up on the requirements, establish methods of sampling, testing and analyzing; and also to consider the advisability of proposing specifications for renovated packing.

The committee has no report on locomotive lubrication at this time.

The report was signed by G. W. Ditmore (chairman), master car builder, D. & H.; P. Maddox, superintendent car department, C. & O.; E. Von Bergen, general air-brake, lubrication and car-heating engineer, I. C.; H. P. Allstrand, assistant superintendent motive power, C. & N. W.; E. L. Johnson, assistant engineer of tests, N. Y. C., and J. R. Jackson, engineer of tests, Mo. P.

Action.—The report was accepted.

Prices for Labor and Materials

In order that the rules may currently provide an equitable basis for inter-road billing, the committee has continued the work of analyzing material, labor and new equipment costs in A.A.R. Interchange Rules 101, 107, 111 and 112 of the Freight Car Code, and Rules 21 and 22 of the Passenger Car Code, with a view of determining and recommending necessary changes to be made in the next supplement to the current Code.

RULE 101

All miscellaneous material prices in Rule 101 were rechecked as of March 1, 1936, quotations from purchasing agents of the 10 selected railroads, representing 39 per cent of total freight car ownership in the United States and Canada, indicating little change in material markets as shown by detail recommendations for revision under this rule. A slight increase in prices for bolts, nuts, forgings, castings, journal bearings, cast-iron wheels and axles is recommended, while a slight decrease is shown in prices for chain, nails, approved types of draft gears and larger sizes of pipe.

New Items 69 to 76 inclusive are added, to provide charge for extra heavy pipe fittings. New Item 121-B is added, to provide charge for "E" type 6¼-in. by 8-in. swivel-shank coupler (excluding swivel butt casting and pin). New Items 179 and 179-A are added, to provide prices for ¾-in. pipe.

First note following heading "Friction Draft Gears" on page 173 is modified to establish equitable credit in cases where approved type gears are substituted as correct repairs for non-approved types, in order that such substitution may not be penalized. Three additional types of non-approved draft gears are added to Section II of the table.

RULE 107

A new note is added to Item 21, to provide additional charge for raising and blocking truck and spring plank to apply rivets securing brake beam supports, when work is performed by this method.

Third note following Item 31, and Item 43, are modified to clarify the intent that the operations in question apply in connection with coupler stop casting rivets as well as bolts.

Third note following Item 270 is modified to make clear that charge for turning wheels may be made for defects which require turning, such as thermal cracks, etc., instead of being confined only to wheels which do not have full flange contour when removed or where fused metal has accumulated on treads.

First note following Item 281 is modified to restrict total charge for repairs by welding of those parts listed under Section (1) of Rule 104, to the second-hand allowance provided therein.

Item 295 is modified to clarify the intent with respect to charge for jacking car, when necessary in connection with work charged under this item.

RULE 111

No modifications are recommended in this rule.

RULE 112

No change in settlement prices for destroyed cars is recommended, due to the small number of cars built during 1935 and the fact that costs reported for hopper cars included a number of cars of special light weight design. Other costs reported vary but little from prices now listed in this rule.

PASSENGER RULE 21

A new last paragraph is added to first note following Item 26, to harmonize with third note following Item 270 of Freight Rule 107.

PASSENGER RULE 22

Changes in material prices in a number of items under this rule are recommended, based on quotations as of March 1 from the purchasing agents of ten representative railroads.

Item 2 is modified to cover the A.A.R. Standard and Alternate Standard passenger type brake shoes adopted by letter ballot last year.

It is the intent of the Committee to investigate labor and material costs again in October and if sufficient change develops, necessary revision will be made and inserted in the Rules effective January 1, 1937.

The changes recommended in the existing rules were shown in detail in the report.

The report was signed by A. E. Calkins (chairman) superintendent of equipment, N. Y. C.; H. H. Harvey (vice-chairman) general car foreman, C. B. & Q.; F. J. Dodds, general car inspector, A. T. & S. F.; P. Kass, superintendent car department, C. R. I. & P.; O. A. Wallace, supervisor car repairs, A. C. L.; T. J. Boring, general foreman, M. C. B. Clearing House, Pennsylvania; J. P. Egan, superintendent car inspection and maintenance, N. Y. N. H. & H.; H. H. Boyd, assistant chief motive power and rolling stock, Can. Pac.; A. E. Smith, vice-president, Union Tank Car Co., and A. H. Gaebler, superintendent car department, General American Transportation System.

Action.—The report was adopted.

Brakes and Brake Equipment

The following report is submitted for consideration:

Braking Ratios for Passenger Cars

This subject has been discussed with members of the Mechanical Advisory Committee of the Federal Co-ordinator of Transportation, the Director, Bureau of Safety, Interstate Commerce Commission, and representatives of the Westinghouse and New York Air Brake Companies, after which the following conclusions have been reached:

We have agreed that the question of braking ratios for passenger equipment cars be divided into two separate and distinct types of equipment.

A—That dealing with conventional passenger equipment cars.

B—That dealing with specially designed light-weight passenger equipment cars for and other cars operated in ultra-high speed service.

For *A* we recommend as a minimum requirement the present standard A. A. R. recommended practice which is a braking ratio of 90 per cent of the empty car weight based on 60 lb. brake cylinder pressure.

For *B* it is the view of your committee that higher braking ratios than specified in *A* for conventional equipment are necessary, but in view of the limited knowledge with respect to the necessary practical braking ratio requirements for such equipment it is obvious that data not yet available will be necessary before any definite minimum requirement can be established.

We also recommend that the present braking ratios for passenger cars as shown on page 7—Sec. E of the Manual, be advanced to standard with a revision to the caption inserting the word "Conventional" between the words "For" and "Passenger."

Braking Ratios for Locomotives

We have also agreed that these braking ratios be divided into two separate and distinct types of locomotives.

C—That dealing with conventional locomotives.

D—That dealing with locomotives designed for and other locomotives operated in ultra-high-speed service.

For *C* we recommend the following minimum braking ratios, all based on 50 lb. brake cylinder pressure:

	Passenger	Freight and Switch
Drivers	60 per cent	50 per cent
Trucks	45 per cent	45 per cent
Trailer	45 per cent	45 per cent
Tender	90 per cent	75 per cent

For *D* it is the view of your committee that higher braking ratios than specified in *C* for conventional locomotives are necessary, but in view of the limited knowledge with respect to the

necessary practical braking ratio requirements for such locomotives it is obvious that data not yet available will be necessary before any definite minimum can be established.

We further recommend the following locomotive braking ratios be adopted as recommended practice and included in the Manual:

BRAKING RATIOS FOR CONVENTIONAL LOCOMOTIVES

Recommended Practice

The following minimum braking ratios, all based on 50 lb. brake cylinder pressure:

	Passenger	Freight and Switch
Drivers	60 per cent	50 per cent
Trucks	45 per cent	45 per cent
Trailer	45 per cent	45 per cent
Tender	90 per cent	75 per cent

With reference to Par. *B* and *D*. It was the unanimous opinion that road tests would be necessary before any definite minimum braking ratios could be established for ultra-high speed passenger cars and locomotives, and it was decided that the committee would request the brake companies to prepare a tentative program of road tests and assist the sub-committee with its final preparation for recommendation.

Hose Nipples

Sometime ago this committee conducted an investigation in connection with air hose failures, which disclosed that as a rule burst hose resulted from manufacturers' defects or damage to the inner tubing, especially in mounting.

The question is now raised as to whether the use of former standard long nipples for 1⅜-in. air brake hose should be perpetuated or if they should be scrapped when hose are remounted and the present A. A. R. standard nipple used exclusively. The purpose of shortening the nipple and changing the contour at the non-threaded end was to minimize damage to hose tubing when hose are pulled apart without uncoupling.

The greater proportion of the above size nipples in service are of the present A. A. R. type and we are of the opinion that the results to be obtained from the use of the present standard justifies their substitution for the former long nipples in remounting air brake hose and recommend that the railroads consider making effective the general use of the present standard short nipple.

Air Brake Defect Card

Your committee feels that the demand for the defect card shown in the Manual does not exist at present and that its use has been generally discontinued, therefore, we recommend its removal from page E-9—1934, and all references thereto.

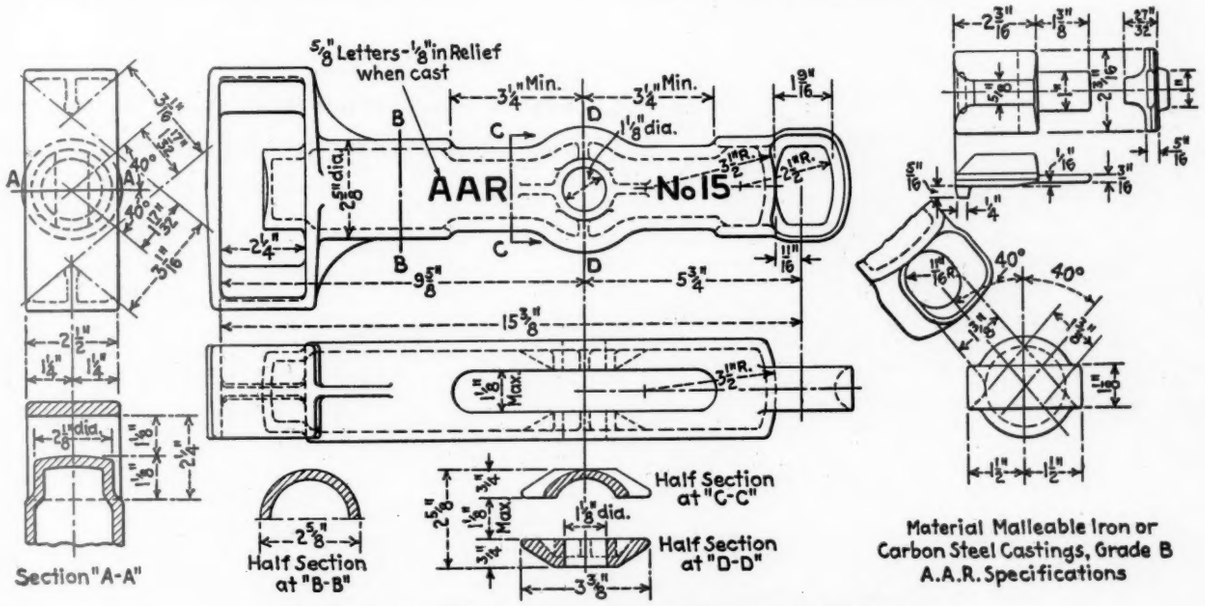
Lap-Joint Packing Rings for Triple Valves

Rule 134 in "Instructions for the Maintenance of Air Brakes and Train Air Signal Equipment" provides that main piston packing rings removed from the piston must not be re-applied. This rule was inaugurated at a time when the old type mitre-joint ring was the standard and was to prevent the re-use of rings which it was necessary to distort in using them in smaller sized cylinders in order that excessive clearance of the joint did not occur. In recent years the air brake companies have developed a new type lap-joint ring which has largely supplanted the above mentioned type and provision is made in the various sizes furnished for suitable clearance at the joint to prevent jamming of the ring ends, which resulted with the old type ring in an effort to fit the joints close enough to prevent ring leakage.

The new type ring has a specially designed lap joint which provides for considerable clearance at the joint without leakage, and within the limits of the permissible joint clearance may be re-applied. The air brake companies are now developing a gage to determine the suitability of rings of this type for re-application, after which it is our intention to recommend a modification of the above mentioned rule in accordance therewith.

Location of "AB" Brake Equipment

Numerous complaints have reached your committee relative to damage to "AB" control valves, particularly on house cars, due to end gates on trucks protruding under cars when backing up for loading and unloading, and hitting the "AB" valve located under or adjacent to the door opening. In conjunction with the Car Construction Committee arrangements have been made to revise Plate 516-A of the supplement to the Manual to provide for the "AB" valve being located at least 24 in. from one side of the door opening. When the width of the door opening or other structural condition makes this impossible, we recommend a substantial shield to protect the valve.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Approved reversible brake-beam strut—American Steel Foundries

Braking Ratio for Light-Weight Freight Cars

The question of braking ratios for light-weight, high-capacity freight cars has been considered by a sub-committee and after discussions with the air brake companies and the Mechanical Advisory Committee to the Federal Co-ordinator of Transportation, it was agreed that the tentative recommendations for braking ratios of light-weight cars was satisfactory.

In view of this action we recommend the following braking ratios for new freight cars:

"The braking ratio for freight cars equipped with empty-and-load brakes shall be not more than 60 per cent of the light weight of car based upon 50 lb. brake cylinder pressure.

"The braking ratio of such loaded cars shall be 30 per cent of the marked nominal carrying capacity plus the light weight of the car, based upon 50 lb. brake cylinder pressure.

"When the marked nominal carrying capacity of freight cars is more than three times the light weight, such cars shall be equipped with an approved design of empty and load brake."

We further recommend that the above requirements be adopted as recommended practice and embodied in the Manual.

Brake Beams

Maintenance and Inspection of Beams and Attachments.—During the past winter numerous complaints have been received relative to failures of brake beams, hangers and attachments, brake beam supports, bottom rods, etc., which have, in many instances, resulted in considerable delay and interruption to traffic. The unprecedented weather throughout the past winter has, no

doubt, aggravated this situation; however, an inspection of these items would indicate that roads generally should establish a suitable campaign in inspection and repairs to these devices in order that hanger pins, bolts, cotters, keepers and various supporting members will be carefully inspected and such corrections made as will relieve this situation.

In many instances improper size and poorly made bolts, pins and cotter keys or keepers are found and the lack of their proper anchoring by spreading so that they are secure to avoid wear and loss. Poor materials and workmanship are common in the fabrication of many hangers, pins, safety supports, etc., which leads to their rapid failure in service.

The committee feels that this is of such importance that greater care should be exercised and closer inspection given the fabrication of all parts comprising the truck foundation brake gear and suggests the application of designs and materials which offer the greatest security to long life and absence of failure.

Numerous failures have been traced directly to brake hangers, pins and materials used in bolts, rivets, etc., which have been found badly burned and fractured during manufacture. Close observance should be given to the requirements of present Interchange Rules regarding inspection of the above items when repairs or renewals are made.

The loop type of brake hanger eliminates the necessity for hanger pins, cotter keys or keepers, such as are generally used and we urge the use of this type hanger so far as possible.

In order that the matter might be brought to the attention of the entire membership, the committee has, at the request of the General Committee, suggested a circular for general distribution and we urge the railroads to observe the recommendations contained therein in order to alleviate, as far as possible, the troubles incident to lack of maintenance of foundation brake gear upon freight equipment.

Specifications for Repairs to Brake Beams.—During the early part of last year a joint subcommittee representing the Arbitration, Car Construction and Brake Equipment Committees, began the preparation of specifications for repairs to freight brake beams. This joint subcommittee has prepared and submits herewith a Specification for Repairs to Freight Equipment Brake Beams which, it is felt, will result in a reconditioned beam of reasonable satisfactory service life expectancy and which will eliminate many failures now experienced as result of secondhand brake beam applications. The specification provides for a proof test for the individual beam and identification marking as a guarantee of repairs in accordance with the provisions of the specification and prescribed test. [Specifications which were included in Exhibit A of the report are omitted in the abstract.—EDITOR.]

A cost work-up of beams repaired under the new specification, based on actual time study, indicates the present secondhand allowance of 65 per cent of price new, should be increased to 70 per cent of price new for the specification repaired beam; and the average credit value reduced from 30 per cent to 23 per cent of price new.

If the specification is adopted as Standard Practice, it is recommended that the Arbitration Committee modify the Interchange Code to provide prices for new beams, for repaired beams per Standard Specification and Test and for average credit value —in lieu of the present new, secondhand and average credit allowances. Also, to provide that secondhand beams which have not been reworked, or which have not been repaired and tested in accordance with the specification, if applied to foreign cars, shall be charged at the average credit allowance.

The proposed specifications have been approved by the Arbitration Committee, Committee on Car Construction and Committee on Brakes and Brake Equipment, with recommendation that same be submitted to letter ballot for adoption as Standard Practice, effective January 1, 1937.

Reversible Brake Beam Struts or Fulcrums.—From time to time requests have been made for approval of reversible struts of various types. Recently the American Steel Foundries submitted drawings and description covering a reversible strut suitable for the No. 15 A. A. R. standard brake beam. A strut of this character provides for the elimination of one brake beam, i.e., right or left hand, from the stock of beams necessary to carry to take care of repairs to freight equipment and at the same time embodies a one-piece strut possessing the strength and rigidity common to that of the present standard strut.

After considering the request of the American Steel Foundries for approval of a strut of this type and the advantages which it possesses, the committee has given its approval for its use to encourage, so far as possible, the standardization of brake beams and related parts.

The report was signed by G. H. Wood (chairman), supervisor air brakes, A. T. & S. F.; W. H. Clegg (vice chairman), chief inspector air brakes and car heating equipment, Can. Nat.; R. E. Baker, general air brake inspector, B. & M.; T. L. Burton, air brake engineer, N. Y. C.; M. Purcell, general air brake inspector, No. Pac.; C. H. Rawlings, general air brake instructor, D. & R. G. W.; M. A. Kinney, general master mechanic, C. & O.; R. C. Burns, general foreman, Penna.; L. S. Ayer, general air brake inspector, So. Pac., and J. P. Stewart, general supervisor air brakes, Mo. Pac.

Discussion

J. W. Burnett, Union Pacific, offered the committee the extensive data on the brake performance which has been developed from tests of the high-speed trains on that road. This the committee was glad to accept.

R. L. Kleine, Pennsylvania, questioned the desirability of prohibiting the restoration of worn surfaces of brake heads by welding, which was the apparent intent of Paragraph (c) of Section III of the Specifications for Repairs to Freight Equipment Brake Beams, in exhibit A of the Committee Report. He said that no trouble had been experienced with brake heads of malleable iron and steel restored in this way. J. McMullen, Erie, was not in favor of the use of welded brake heads except on home cars. W. H. Clegg, Canadian National, said that, while some welding was good, not all of that done around car departments was satisfactory. Considering the price of new brake heads, he did not consider the economy was great enough to justify permitting the welded brake heads to be used on other than system cars. On motion of Mr. Kleine, the paragraph of the Specifications in question was referred back to the committee to be revised to specify limits of wear within which welding is permissible.

Action—Subject to the above change, the report was accepted and referred to letter ballot.

Air Conditioning and Equipment Lighting

A comprehensive and detailed series of tables covering air-conditioned cars now in service constitutes a major part of the report. The data are classified in four ways: (1) tyues of cars, (2) types and kinds of air-conditioning systems, (3) types of motor drive, and (4) capacities of generators with respective types of drive.

In addition to this, the committee gave particular attention to the question of voltage of power supply to railway passenger cars. Concerning this subject, the committee offers the following for information and guidance for future study:

"In the past several years there has been a gradual increase in general demand for electric power as supplied by the 32-volt axle-driven generator and battery equipment on passenger cars. Generally speaking, to take care of this situation axle generator equipments have been duplicated or have been increased by 2 to 5 kw. each, and batteries have been increased by 200 amp.-hr. to 600 amp.-hr. capacity.

"With the introduction of electrically operated air-conditioning equipment on railway passenger cars using the 32-volt system, it has been necessary to either increase the 32-volt axle generator from 5 kw. to 10, 15 or 20 kw., and increase the battery capacities to 1,000 or more amp.-hr., or install an additional 32-volt axle generator and battery of sufficient capacity to take care of that load independently of the lighting and other auxiliary load.

"There has been no particular difficulty with the satisfactory operation of the so-called 32-volt axle generator equipment and battery, but if the extended use and increase in 32-volt generator capacity is to be practically met, some other system of higher-voltage generation and power distribution must of necessity be considered.

"The committee feels that the general public is becoming more and more accustomed to a high intensity of illumination in their homes and places of business, and for this reason expects the railroads to provide illumination of comparable intensity in their passenger cars. Also, the trend to artistic effects in illumination naturally calls for a greater amount of power to obtain the effects desired. Therefore, as noted above, there seems to be a well founded reason why the demand for power will steadily increase. Serious consideration should be given to the study of a suitable system of electric power generation and distribution that will take care of this phase of passenger equipment in railway service for some considerable time. Obviously, a power generating and distributing system designed to supplant the present 32-volt system will be far-reaching and expensive. The subject should be approached slowly and deliberately, and the situation studied and watched very closely, at least for the next year or two.

"As a matter of preliminary information, there are several power and voltage systems which can be used to replace the 32-volt axle generating system, i.e.:

"1—The 64-volt generator system will increase the capacity and double the number of cells. Because of the higher voltage, the transmission of power with smaller size wires will be possible, but this system would probably only take care of the situation for a short time under the present rate of increase in the electrical load.

"2—The 110-volt axle generator system will increase the capacity but requires three and one-half times as many cells of battery as the 32-volt system, and one and three quarters times the number of cells required by the 64-volt system.

"The 110-volt system requires 55 cells of battery and, therefore, the question of weight and battery space under the passenger car seems to be a serious handicap. Again, if air conditioning by electricity is to be extended, this system would not seem adequate.

"3—The third system, which would appear at the present time to give promise of a more permanent nature, would be the centralized independently driven 440-220-volt, three-phase, 60-cycle generating power plant located at the head end of the train, the current transmission being carried to each car by means of a three-phase, 220-volt, 60-cycle train line. With this 220-volt a.c. system the present 32-volt batteries and lights could remain as at present. Some changes would possibly have to be made, substituting universal type motors for the present 32-volt fans and other auxiliary equipment, which could be operated on either 32-volt d.c. or 32-volt a.c. A small transformer could be placed in each car to reduce the 220-volt a.c. to 32-volt, and a motor-generator set, converter, or rectifier unit installed for battery charging from the 220-volt, three-phase line.

"The 220-volt, three-phase, 60 cycle power generating and distribution system will also fit in with the present trend of power generation and distribution on streamline trains and Pullman stand-by services. In fact, cars now equipped with the 220-volt, three-phase stand-by motors, could be operated direct from the central plant, eliminating the mechanical drive.

"Two hundred-twenty-volt, three-phase, 60-cycle power is the universal commercial power used and no difficulty would be experienced in obtaining stand-by power at practically all yards, terminals and lay-over points. A centralized power plant and 220-volt system would take care of power requirements indefinitely."

Plugs and receptacles for making connections to air-conditioned cars from outside power sources are not fully interchangeable. To correct this condition, the committee has included drawings of plugs and receptacles, and it recommends the adoption of these as recommended practice.

The report is signed by W. E. Dunham (chairman), superintendent car department, C. & N.W.; E. Wanamaker, electrical engineer, C.R.I. & P.; A. E. Voigt, car lighting engineer, A.T. & S.F.; F. O. Marshall, electrical engineer, Pullman Company; P. J. Callahan, supervisor car and locomotive electric lighting, B. & M.; O. M. Bixby, assistant engineer, N.Y.C.; I. V. Goodman, assistant electrical engineer, Pennsylvania; and G. W. Bebout, electrical and shop engineer, C. & O.

Action.—The report was accepted and the recommendation regarding a plug and receptacle for stand-by power connections was ordered submitted to letter ballot.

Safety Appliances

Standard specifications covering geared hand brakes, as recommended by the Committee on Brakes and Brake Equipment, and the Committee on Car Construction, were approved for standard practice by letter ballot, December 18, 1935, to become effective March 1, 1936.

Automatic Train Line Connectors

The Joint Committee on Automatic Train Line Connectors of the Operating and Mechanical Divisions, at a meeting on September 10, 1935, unanimously recommended that laboratory tests of the two connectors that have given the most satisfactory performance under the tests conducted to date be continued to develop the performance of these devices under snow and ice conditions. They also recommended that H. A. Johnson continue as Director of this investigation, and that report covering the tests of the automatic train line connectors will not be made to the member roads of the Association, or to the Interstate Commerce Commission, until after the tests of the two selected devices, under ice and snow conditions, are completed.

H. A. Johnson reported, under date of April 8, 1936, that "The train line connectors which were used in the ice and snow tests in the Monon yards have been taken apart and examined for the effect of weather and the tests which were run on them. Laboratory tests on the oscillating machine were run on the Robinson ball and funnel and the Johnson type passenger train line connectors which have been exposed to weathering conditions since last fall. The tests are now completed and the report is being prepared."

Metal Running Boards

Copies of report covering the inspection and tests of metal running boards, to which was attached a tabulation covering information relative to the weight, cost, maintenance, and life of metal running boards, compared with wooden running boards, were sent to all members of the General Committee and the Committee on Safety Appliances. This report was received as information by the General Committee at its meeting on November 7, 1935.

The report was signed by Chairman R. G. Henley, superintendent motive power, Norfolk & Western; Vice-Chairman F. W. Hankins, chief of motive power, Pennsylvania; C. J. Bodemer, superintendent machinery, Louisville & Nashville; F. H. Hardin, assistant to president, New York Central; J. Purcell, assistant to vice-president, Atchison, Topeka & Santa Fe, and J. J. Tatum, general superintendent car department, Baltimore & Ohio.

Action—The report was accepted.

Specifications for Materials

The committee during the past year has reviewed a number of the specifications and considered comments and criticisms submitted by members of the Association or others.

At the request of the Secretary, this committee has reviewed the action taken by the Purchases and Stores Division in standardizing tinware, and approves this action.

1—Specifications M-101-34, Axles, Carbon Steel, for Cars and Locomotive Tenders.

In paragraph on Workmanship, 9 (b), change the last sentence, which now reads "The rough turning shall be done with a broad-nosed tool so that the surface is free from chatter marks," to read

"The rough turning shall be done so that the surface is free from objectionable ridges and chatter marks."

While this wording is somewhat general it is believed that it will take care of some of the objections that have been raised to the present wording.

2—Specifications M-108-34, Boiler Tubes, Lap-Welded and Seamless Steel and Lap-Welded Charcoal Iron.

The revision of these specifications has been principally to bring them into line with other standard specifications and current practice, but it also seems desirable to expand the scope so as to include electric-resistance-welded tubes which have been put into use by a number of railroads.

3—Specifications M-109-34, Structural Rivet Steel and Structural Rivets.

These specifications have been revised principally to bring the tables of dimensions and tolerances into agreement with those of the American Standards Association and eliminate the steeple headed rivets.

4—Specifications M-110-34, Boiler Rivet Steel and Boiler Rivets.

In order to cover the present practice of cold forming and normalizing of rivet heads used by certain manufacturers, Par. 2 (b) has been changed to read as follows:

"(B) Rivet heads may be hot formed or cold formed and normalized."

5—Specifications M-111-34, Welded and Seamless Steel Pipe.

These specifications have been revised to include electric resistance welded pipe, and provide for test of galvanized pipe.

6—Specifications M-115-34, Boiler and Firebox Steel for Locomotives.

On account of some misinterpretation of the meaning of the carbon range on firebox steel, this has been changed so as to eliminate the minimum.

7—Specifications M-118-34, Coupler and Knuckle Pivot Pins.

On account of the average of the present carbon range 0.55 to 0.75 per cent coming above the limit of 0.60 and thereby causing an extra classification, the carbon range has been changed to read

"0.52 to 0.67 per cent."

8—Specifications M-201-34, Steel Castings.

The following changes are made in order to clarify the meaning of the paragraphs affected.

Par. 14, in the last sentence insert the word *apparently* between *and* and *suitable*, making this read *and apparently suitable*, etc.

Par. 15 (a), change the last sentence to read *or to the dimensions predicated by the pattern*, etc.

9—Specifications M-301-34, Iron and Steel Chain.
M-302-34, Refined Wrought Iron Bars.
M-304-34, Staybolt Iron, Hollow Rolled.
M-305-34, Staybolt Iron, Solid.
M-306-34, Welded Wrought Iron Pipe.

In all of the above specifications change the maximum manganese from 0.05 per cent to read 0.06 per cent. This is in accordance with recent discussion with the wrought iron manufacturers and agreement that the present 0.05 per cent maximum manganese was unduly restrictive.

10—Specifications M-304-34, Staybolt Iron, Hollow Rolled.

Par. 5, *Tension Tests.* Add a new Par. (c), reading as follows:

"(c) In calculating the tensile strength, yield point and reduction of area, the area of a 7/32-in. hole shall be deducted from the area of the bar."

11—Specifications M-305-34, Staybolt Iron, Solid.

In Par. 5, Tension Tests, insert new paragraphs, (c) and (d), reading as follows:

"(c) For bars 7/8 in. down to 11/16 in. diameter inclusive, a minimum elongation of 28 per cent shall be permitted; for bars 5/8 in. and less in diameter, a minimum elongation of 25 per cent shall be permitted."

"(d) For bars over 1¼ sq. in. in sectional area, the following deductions from the minimum requirements specified in Section 5 (a) shall be made for each square inch of nominal section above 1¼ sq. in.:

Tensile strength—250 lb., but not under 46,000 lb. per sq. in.

Reduction of area—3 per cent, but not under 40 per cent.

12—Specifications M-605-34, Steam and Hot Water Hose.

On account of the difference in effect between the rack and the digester test, Par. 8 (b) has been changed to permit somewhat greater deterioration in tensile results when the digester test is used, as follows:

"(b) After the steam test, an increase or decrease of not more than 40 per cent from the original results will be permitted in tensile strength and elongation of tube and cover when the rack test is used, and not more than 50 per cent variation when the digester test is used."

Recommendations

The committee recommended that the above revisions in specifications be approved for submission to letter ballot.

The report was signed by: F. M. Waring (chairman), engineer of tests, Penna.; T. D. Sedwick (vice-chairman), engineer of tests, C.R.I. & P.; C. P. VanGundy, engineer of tests, B. & O.; Frank Zeleny, engineer of tests, C.B. & Q.; H. G. Burnham, engineer of tests, Nor. Pac.; J. C. Ramage, engineer of tests, Southern; H. W. Faus, engineer of tests, N.Y.C.; E. E. Chapman, engineer of tests, A.T. & S.F.; H. P. Hass, engineer of tests, N.Y.N.H. & H.; J. R. Jackson, engineer of tests, Mo. Pac.; H. G. Miller, engineer of tests, C.M.St. P. & P.

Action.—The report was accepted and the recommendations ordered referred to letter ballot.

Loading Rules

As the result of meetings held with shippers and investigations conducted during the past year, the committee recommended changes in the loading rules as shown below. In connection with the general rules, the suggestion was made to eliminate the words in parenthesis, (1 to 19) in the heading on page 12 since this is taken care of in the second sentence of Rule 1.

RULE 1

Change second sentence of Rule 1 to read:

"Special instructions must be procured from the originating carrier for shipments on open top cars not covered in these rules, and exacting care must be exercised to see that the details in Rules 1 to *21,* inclusive, are complied with in connection with all loading, except as otherwise specified in this code of rules."

Reason: To include Rule 20 as contained in Supplement No. 2 and to provide for new Rule 21.

RULE 3

Change to read as follows: *"Clearance—Side Bearing*—Trucks must curve freely and the average clearance between side bearings must not be more than ¼ in., or less than ⅛ in. per side bearing per truck."

Reason: To harmonize with the present wording in the Manual on Page 3, Sec. C, of the 1935 revision.

RULE 6

Change to read as follows:

"Weight of Load (Rule 4), on Bearing Pieces With or Without Sliding Pieces.

(a) Weight carried on one bearing piece per car should not exceed the percentage of stenciled load weight limit, as shown in columns 7 and 8 of Tables No. 18 to 50, inclusive, depending on the class of car as shown in the table.

(b) Weight carried on top of gondola car sides between body bolsters must not exceed one-half of the load limit of car. Height of loads on top of gondola car sides, measured from top of rail to center of load must not exceed 9 ft. 3 in. at bearing pieces. Short material underneath load on top of gondola cars must be equally distributed over car floor, but the entire load on wooden underframe cars must not exceed three-fourths of the load limit of car.

(c) Lading on top of gondola cars with wooden sides less than 3 in. thick, or steel gondola cars with sides not sufficiently strong to carry load is prohibited. Corner stakes of cars with drop ends must be suitably reinforced for loads on top of sides, except when especially prepared for the particular lading."

Reason: To conform with two new columns in Tables 18 to 50.

RULE 8

Change Sec. (d) to read:

"Provide 4 in. clearance between underside of load and car, for loads on two or more cars; also for that portion of loads overhanging idler cars."

Reason: To clarify the intent.

RULE 10

Change second paragraph Sec. (c) to read:

"When boards are specified, use at least one 1 in. by 5 in., for each pair of stakes for load 12 in. or less above top of car sides, and at least two such boards to each pair of stakes for load over 12 in. above top of car sides; *using* three 10-D nails *in each end of each board."*

Reason: To clarify the intent.

RULE 14

Change Sec. (b) to read:

"Nails treated to increase holding power, preferred. The length shall be such as to prevent them being driven through sides or ends of cars."

Reason: To broaden the scope.

RULE 16

Change to read as follows:

"Loads on One Car Overhanging One or Both Ends—Width, Height and Length.

(a) Table 1 shall govern in deciding the maximum width according to length of overhanging loads on single cars. For intermediate lengths of cars, not listed in this table, the maximum length and width of overhanging loads as shown for the next longer car shall govern. Determine length of cars by measuring to outside face of end sills. The total length of lading must not exceed the limits as shown in Tables 2 to 17, inclusive—Rule 17.

(b) The overhang is measured from center of truck to extreme end of overhang. For loads over 12 ft. high from top of rail to top of load, the given width must be reduced 2 in. for each inch in height for that portion of load in excess of 12 ft.

Table now in Rule 16, should be changed to Table 1, in the new book."

Reason: To clarify the intent.

RULE 17

Change to read as follows:

"Weight Restrictions for Loads on One Car Overhanging One or Both Ends.

(a) Tables 2 to 17, inclusive, shall govern in deciding the maximum weight of loads overhanging one or both ends of a car. Long steel, liable to take permanent set by bending must rest on sufficient bearing pieces to prevent sagging.

(b) Allowable weight on cars of intermediate lengths not specified in tables, should be obtained by adding one-fourth the difference between the weights shown for the next shorter and longer car to the weight shown for the shorter car, for each six inches more than shown for the shorter car.

(c) Allowable weights of intermediate lengths of material not specified in tables, should be obtained by adding one-fourth of the difference in weight shown for next shorter and longer length of material, to the weight shown for the shorter length, for each six inches more than shown for shorter length.

(d) The length of overhanging pieces may be determined by the average length of the pieces in that portion of the load.

(e) Material, uniform weight throughout and uniform length and width of portions overhanging both ends of one car, and not supported on sliding pieces, may be loaded to load weight limit of car."

Reason: To economize for shippers.

RULE 18

Change to read as follows:

"Load on Two or Three Cars—Width, Height, Overhang.

(a) The width of load, distance between bearing-pieces, and length of overhang must not exceed the dimensions shown in Tables 18 to 50, inclusive, for loads 12 ft. high or less, measured from top of rail to top of load. For loads over 12 ft. high from top of rail to top of load, the given width must be reduced 2 in. for each inch in height for that portion of load in excess of 12 ft. For loads of uniform width throughout length of load, the minimum width "W" is to apply.

(b) When cars of different lengths are used for the same load, the maximum width of load shall be as shown in the tables for longest carrying car used.

(c) For cars of intermediate lengths not shown in the tables, the maximum width of loads on carrying cars must be governed by the next longer car shown in the tables. Determine length of cars by measuring to outside face of end sills.

Note: The above mentioned tables are based on 10 ft. 6 in. clearance width limits, 15 deg. curvature, and 3 in. tolerance on each side of load."

Reason: Reference to coupler spacing blocks, etc., eliminated account taken care of by new Rule 21. New paragraph (a) provided to eliminate duplicate printing.

Add sketch "Arrangement of Load on Two or Three Cars, per Tables 18 to 50 Inclusive."

Reason: To make it possible to eliminate sketches shown on pages 27, 29, 31, 33, 35, 37, 39, 41, 43 and 46.

Add two columns to Tables 18 to 50, inclusive, to show percentage of permissible load weight.

Reason: To improve the rule.

RULE 19

Both old and new heading, now shown in Supplement No. 2. Eliminate old heading, also the wording "Rule changed to read as follows:"

NEW RULE 21

To read as follows: "Coupler-Preparation of.—Apply coupler spacing blocks, per Fig. 3, and make uncoupling mechanism inoperative per Fig. 4, when load is carried on one or more cars with overhang resting on sliding pieces on idler car, and when load is carried on more than one car."

Reason: To eliminate duplicate printing in other rules and figures.

[The report at this point included recommended changes in loading practice as specified in 39 figures, with the usual objectives of providing better loading, to save shipper expense, economize in printing, etc. These changes applied to Figs. 2, 3, 4, 6, 9, 30, 47, 48, 70, 81, 85, 86, 87, 96, 115, 131, 136, 137, 138, 145, 146, 147, 153, 154, 156, 159, 165, 166, 167, 168, 170, 171, 176, 179, 180, 183, 186, 187, and 188, inclusive. Three new figures, namely, Figs. 201, 202 and 203, were added to provide for the loading of pulp grinder stones on gondola or flat cars, and new Figure 209A, to provide an alternate method of loading boxed automobiles on gondola cars.—EDITOR.]

The report was signed by Chairman Samuel Lynn, superintendent rolling stock, Pittsburgh & Lake Erie; Vice-chairman E. J. Robertson, superintendent car department, Minneapolis, St. Paul & Sault Ste. Marie; R. H. Dyer, general car inspector, Norfolk & Western; G. R. Lovejoy, master mechanic, Detroit Terminal; T. O. Sechrist, assistant superintendent machinery, Louisville & Nashville; C. J. Nelson, superintendent of interchange, Chicago Car Interchange Bureau; H. S. Keppelman, superintendent car department, Reading; W. B. Moir, chief car inspector, Pennsylvania; J. A. Deppe, assistant superintendent car department, Chicago, Milwaukee, St. Paul & Pacific.

Discussion

Mr. Lynn, the committee chairman, in presenting the report said that the work of the committee during the past year had largely been devoted to efforts to reduce the cost to the shipper of compliance with the rules. He pointed out the importance to the railways of this item of total transportation cost as a factor in their competition with other forms of transportation. The shippers, he said, are being forced to ask the committee to make changes, which formerly they would not have asked, to meet not only their own requirements but the requirements of their customers. He cited as an instance the matter of loading sheet steel on flat cars because it is cheaper to unload from the flat car than from the other types. This, he said, was one of the subjects now under consideration by the committee. He pointed out that the shippers willingly co-operate with the committee and were going to considerable expense to demonstrate the safety of proposed changes in methods of loading. Much as the committee feels its responsibility in reducing loading costs, he said, every member of the committee has constantly before him as the first consideration in its work the necessity for safety. It was pointed out that the minimum requirements for securing lumber on flat or gondola cars in connection with figure 6 in the committee's report, while this method is an improvement, it still requires additional fastening in the case of dressed lumber to prevent it from spilling. C. J. Nelson of the committee said that the members were aware of this situation and were convinced that it could not be dealt with satisfactorily without additional expense to the shipper. He said that experiments with steel bands, which are now being made, should be encouraged and promised the full co-operation of the committee.

Action.—The report was accepted and the recommendations referred to letter ballot.

Arbitration Committee

As a result of letter-ballot action in 1933, the coupler manufacturers were directed to scrap their patterns for Type D coupler bodies, due to the Type E coupler having been adopted as Standard by the Association in 1931 as a distinct improvement over Type D coupler. However, the manufacturers continue to receive orders for the latter type and, upon suggestions by the Committee on Couplers and Draft Gears, a new requirement is recommended under Rule 3, effective January 1, 1937, prohibiting Type D couplers cast after August 1, 1936, on all cars in interchange.

A second new requirement is recommended under Rule 3, making the defect card receptacle mandatory for cars built new or rebuilt on or after January 1, 1937, as a safety measure and to facilitate inspection in interchange. The cost is little more than for the cardboard used for this purpose and many recommendations urging the use of the receptacle have been received from railroad clubs and car inspectors.

No further extension in effective date beyond January 1, 1937, has been recommended for requirement in Freight Rule 3 for the A.A.R. Standard draft key retainer, or approved equivalent. This recommendation is in the interest of safe operation and has the concurrence of the General Committee. No further extension in effective dates beyond January 1, 1937, has been recommended for requirements in this rule concerning stake pockets on flat cars. No requests for extension of these dates have been received and the committee feels ample time has elapsed to permit compliance. In accordance with 1934 letter ballot action, no further extension beyond January 1, 1937, will be granted for requirement prohibiting acceptance of Class E-4 cars from owners.

In accordance with recommendation by the Committee on Brakes and Brake Equipment, as approved by letter ballot last year, recommendations for modification of Rules 19 and 62 are submitted, to provide that, effective January 1, 1937, the new reinforced-back brake shoe per 1935 specification, must be used in repairs to foreign cars to justify bill.

Upon recommendation by the Joint Subcommittee on Material Charge for Secondhand Details, consisting of representatives of the Mechanical and Purchases and Stores Divisions, your committee has listed fifteen additional items for which charge is recommended on basis of 50 per cent of value new, when applied, secondhand, in repairs to owner's defects or on authority of defect card. It is felt this basis provides an equitable allowance for such secondhand material.

No further extension in effective date beyond January 1, 1937, is recommended for the requirement in Passenger Rule 2 which provides that cars other than passenger-carrying equipment must be equipped with metallic steam-heat connectors. No requests for extension of this requirement have been received and it is felt sufficient time has elapsed to permit compliance insofar as the above cars are concerned. In the case of passenger-carrying equipment, a one-year extension in effective date is recommended.

The committee does not feel that any of the modifications included in its report necessitate submission to letter ballot, the majority of them being routine and covering changes recommended by the Committee on Car Construction, Committee on Couplers and Draft Gears, Committee on Brakes and Brake Equipment and the Committee on Tank Cars, extension of effective dates of various requirements and changes necessitated by letter-ballot action last year.

The matter of complaints as to failure of secondhand brake beams was referred to in the 1935 report, with advice that a specification for reclaimed beams had been prepared by a joint subcommittee (consisting of members of the Arbitration, Brake and Car Construction committees), and that the report of this joint subcommittee had been approved, subject to review of prices by the Committee on Prices for Labor and Materials and approval of the method of repairs by the Committee on Car Construction. These recommendations will appear in the 1936 report of the Committee on Brakes and Brake Equipment. If

the specification is approved by letter ballot, this committee will immediately formulate the necessary changes suggested for the Interchange Rules.

During January, 1932, an investigation of the cost of accounting for car repairs was authorized by the Board of Directors of the Association and conducted under the direction of your committee. Copy of progress report of this investigation was mailed to member roads in July, 1933, and dealt, specifically, with the question of establishing central or regional clearing houses for the preparation and checking of car repair bills. Final report of the Special Subcommittee on Economies in connection with Cost of Billing for Foreign Freight Car Repairs, which also deals with the question of elimination of car repair billing, has been submitted and both the report and conclusions reached were unanimously approved by the General Committee. Copies of this final report were distributed to member lines on February 26, 1936. An abstract of same has been prepared and is printed as Exhibit B to this report.

All recommendations for changes in the Rules of Interchange submitted by members, railroad clubs, private car owners, etc., have been carefully considered by the committee and, where approved, changes have been recommended.

Attention is again directed to the fact that the Arbitration Committee will not consider questions under the Rules of Interchange unless submitted in the form of Arbitration Cases as per Rule 123.

Freight Car Rules

Rule 3

The committee recommends that effective dates for various requirements in the present rule, as listed below, now set at January 1, 1937, be extended to January 1, 1938:

Section (a) Paragraph (7)—Axles under 70,000 lb. capacity cars.

Section (b) Paragraph (6)—Brake-beam hangers with eyes not formed solid.

Section (b) Paragraph (8)—Bottom-rod and brake-beam safety supports.

Section (r) Paragraph (3)—Hatch covers to be secured by hinges.

Section (t) Paragraph (8)—Head-block anchorage on tank cars.

Section (t) Paragraph (9)—Wood shims between longitudinal anchorage and underframe, on tank cars.

Section (t) Paragraph (14)—Dome covers secured by hinge or chain, on tank cars.

Section (t) Paragraph (16)—Class I tank cars prohibited in interchange.

The committee recommends that Paragraph (3) of Section (t) of this rule be modified to add *excessive corrosion* to the conditions which prevent the substitution of second-hand cast steel truck side frames.

The committee recommends that Paragraph (15) of Section (t) of this rule be modified by substituting the term *car structure* for *underframe* and by replacing the reference to the A.A.R. Specification for *Class III, Tank Cars, effective May 1, 1917, to July 1, 1927,* with reference to Specifications for *Tank Cars, effective March 1, 1931.*

The committee recommends that the first note following Paragraph (1) of Section (u) of this rule be modified by adding the words *or equivalent strength* at the end to accord with the fact that with the use of Cor-Ten steel the net area of center-sill section may be reduced from 21.3 sq. in. to 17 plus sq. in., this being in proportion to the characteristics and physical properties of the material.

Rule 4

The committee recommends that Paragraph (1) of Section (h) of this rule be modified as follows:

Proposed Form—(h) (1) Tank cars. Sheets, heads or domes of non-insulated cars, when bent inwardly in excess of 8 in. by 8 in., or equivalent area, or when bent inwardly in excess of ¼ in. in depth regardless of area; *however, dents in heads due to present or former head-block anchorage, will be owner's responsibility.*

Rule 5

The committee recommends that the extended time limits of second paragraph of this rule, as shown in the 1936 Code, be continued until January 1, 1938, because the curtailment in car repairs results in holding of bad-order cars under present conditions.

Rule 17

The committee recommends that the "remarks" column reference to items 26, 28 and 30 appearing in the Knuckle Table in Paragraph (2) of Section (c) of this rule be modified in the next supplement to make clear that no charge is to be made for the knuckles in these items if applied to Type E couplers and that, if the knuckles removed as specified in these items are in good condition, secondhand credit must be allowed.

The committee recommends that a new section (j) be added to this rule, effective August 1, 1936, as follows:

Proposed Form—(j) *In the application of brake-beam hangers, a difference in length of ⅜ in. (plus or minus) from that standard to car, will be considered as proper repairs.*

Rule 18

The committee recommends the addition of a new last paragraph to this rule, with new Fig. D, as follows:

In the application of secondhand couplers complete, or secondhand coupler bodies, the shank shall not be less than 21 in. in length from striking horn to crest of worn surface of butt, nor less than 3⅞ in. from pulling (rear) surface of horizontal key slot to crest of worn surface of butt, established with parallel straight edges; otherwise, such body shall be charged at scrap value. (See Fig. D following). Coupler bodies having such minimum dimensions shall not be removed from cars for these defects alone, but if removed for other reasons and are otherwise in serviceable condition same shall be credited at secondhand value, with no allowance for expense of reclamation.

Rule 19

The committee recommends that ninth item listed under this rule, covering material that must not be used in making repairs to foreign cars, be modified in the next supplement as follows:

Proposed Form—Plain cast-iron brake shoes must not be used. New reinforced-back brake shoes must be used to justify bill. *Effective January 1, 1937 new reinforced-back brake shoes meeting requirements of A.A.R. Specification adopted in 1935 must be used to justify bill.*

Rule 20

The committee recommends that second paragraph of this rule be modified as follows:

Proposed Form—When construction of car and trucks precludes the common methods of adjusting coupler heights, the application of metal shims between journal boxes and arch bars or truck sides, *or the riveting or welding of metal shim to coupler carrier iron, is permissible.*

Rule 45

The committee recommends that this rule be modified so that instead of applying to center sills bent between bolsters, it will apply to *one or both metal center sills broken between bolsters* as well as to *one or both center sills* bent between bolsters; and to make it clear that handling-line responsibility applies to bent sills only if subsequently broken under the provisions of Rule 32.

Rule 49

The committee recommends that last sentence of Paragraph (a) of this rule be modified and included in the next supplement, as follows:

Proposed Form—Where receptacle is used, same should be in accordance with A.A.R. Recommended Practice specification, applied one per car, preferably located as follows, *or at other location conveniently accessible,* but in no case more than 5 ft. 6 in. from top of rail.

Rule 62

The committee recommends that second paragraph of this rule be modified in the next supplement, as follows:

Proposed Form—No charge shall be made for application of separate common nuts unless such nuts are fully tightened, and, where applied to journal-box bolts, column bolts or brake-hanger bolts, such common nuts must be secured with nut lock or lock nut.

Note—It will be understood that the above provision also applies when such bolts are renewed.

Rule 66

The committee recommends that Section (g) of this rule be modified to show that the conditions of the section apply when repacking is due to change of *one or more pair of wheels in each truck,* because present wording is being misconstrued to mean that all wheels must be changed to justify the one-half-hour labor charge.

Rule 70

The committee recommends that Section (c) of this rule be modified, effective August 1, 1936, as follows:

Proposed Form—(c) A.A.R. double-plate shall not be substituted for A.A.R. single-plate cast-iron wheels. *For the purpose of this rule a single-plate wheel and a double-plate wheel mounted on same axle shall be considered as a pair of double-*

plate wheels, and charged and credited accordingly. Defect card is not required for such improper substitution of wheels. (See Rule 98, Section (c-5), for charges and credits).

This change is to discourage the substitution of such mixed wheels in place of single-plate wheels, in repairs to foreign cars.

RULE 87

The committee recommends that the extended time limit of first paragraph of this rule, as shown in the 1936 Code, be continued to January 1, 1938.

RULE 91

The committee recommends that the second paragraph of Section (b) and the last sentence of Section (c) be modified to permit 60 days within which countercharge authority may be issued, for the reason that the rule should give as much time to answer exceptions as it does to take exceptions to a bill.

RULE 92

The committee recommends that a new last paragraph be added to this rule, to read as follows:

In the case of leased cars, upon request by owner, such cars shall be grouped by initials and consolidated in same monthly bill with cars bearing owner's name or initials. However, separate statement and totals for each such group need not be furnished.

There is no objection to rendering bill in this manner, if so requested by car owner. However, separate statements and totals constitute additional work which should not reasonably be imposed upon repairing line.

RULE 94

The committee recommends that the extended time limits of first paragraph of this rule, as shown in the 1936 Code, be continued until January 1, 1938.

RULE 98

The committee recommends that a new note be added following Section (g) of this rule, to read as follows:

Note—In the predetermination of service metal on wrought-steel wheels by use of the standard wrought-steel wheel gage, when neither wheel is scrap, the amount of metal required to be turned off the wheel suffering the greater amount of loss, should apply equally to the mate wheel.

RULE 104

The committee recommends that Section (a) of this rule be modified as follows:

Proposed Form—(a). Secondhand A.A.R. Type D, Type E, swivel shank couplers and couplers having radial butt, or parts of same, shall be charged and credited at 75 per cent of value new. Credit shall be allowed for all parts of such couplers. *Secondhand cast-steel coupler yokes of 24⅝-in. pocket spacing and secondhand two key forged coupler yokes, when both types are designed for 1½-in. by 6-in. horizontal cross keys, shall be charged and credited at 75 per cent of value new.*

The committee recommends that the following items be added to Section (1) of this rule, to be charged at 50 per cent of gross value new, less credit for part removed, when applied, secondhand, in repairs to owner's defects or on authority of defect card:

Air-brake parts as follows:
Auxiliary reservoir, detachable type (Nos. 2445, 24446), per Item 8, Rule 101.
Auxiliary reservoir, combined type (Nos. 2439, 21838), per Item 9, Rule 101.
Cylinder body, detachable or combined type (Nos. 67928, 68462), per Item 19, Rule 101.
Cylinder, complete, detachable type (with cylinder piston packing), Nos. 69817, 69751, per Item 19-B, Rule 101.
Cylinder and reservoir, complete, combined type (with cylinder piston packing), Nos. 69816, 69818, per Item 19-C, Rule 101.
Triple valve body, complete, old style, W. A. B., per Item 52, Rule 101.
Triple valve body, K1 and K2 types, per Item 54, Rule 101.
Triple valve, complete, convertible type, per Item 56, Rule 101.
Triple valve, complete K1 or K2 Standard, per Item 57, Rule 101.
Coupler yokes, except as provided in Section (a).
Draft arms.
Draft lugs.
Draft springs, other than those used in connection with friction draft gears.
Metal roofing, including caps.
Truck-spring caps, pressed steel. (This includes bottom caps, often designated as truck-spring seats.)

Passenger-Car Rules

RULE 4

The committee recommends that the effective date of second paragraph of this rule, with reference to equipping all steel or steel underframe cars with cardboards or suitable receptacle for the accommodation of defect and joint evidence cards, now set at January 1, 1937, be extended to January 1, 1938.

RULE 7

The committee recommends that a new Paragraph (3) be added to Section (h) of this rule, to read as follows:

(h) (3) In the application of secondhand couplers complete, or secondhand coupler bodies, the shank shall not be less than 21 in. in length from striking horn to crest of worn surface of butt, nor less than 3⅞ in. from pulling (rear) surface of horizontal key slot to crest of worn surface of butt, established with parallel straight edges; otherwise, such body shall be charged at scrap value. (See Fig. D of Freight Rule 18.) Coupler bodies having such minimum dimensions shall not be removed from cars for these defects alone, but if removed for other reasons and are otherwise in serviceable condition same shall be credited at secondhand value, with no allowance for expense of reclamation.

The committee recommends the addition of a new Section (m) to this rule, to read as follows:

(m) Refrigerator cars, designed and constructed for passenger-train service, must be reweighed and restenciled only by owners or their authorized representatives.

RULE 8

The committee recommends that a new Item 16 be added to Section (a) of this rule covering delivering line defects, to read as follows:

(16) Failure to uncouple steam hose or metallic steam connectors when uncoupling cars.

RULE 9

The committee recommends that Section (e) of this rule be modified by substituting for the words *cleaning and steaming when performed periodically* the words *periodic sanitary cleaning.*

RULE 21

The committee recommends that Item (17) of this rule be modified by substituting for the words *cleaning and steaming* the words *periodic sanitary cleaning.*

The report was signed by: W. H. Flynn (chairman), general superintendent motive power and rolling stock, N.Y.C.; C. T. Ripley (vice-chairman), chief mechanical engineer, A.T.&S.F.; T. W. Demarest, general superintendent motive power, Penna.; T. Beaghen, Jr., superintendent car maintenance, Mexican Petroleum Corporation; J. J. Hennessey, assistant superintendent car department, C.M.St.P.&P.; L. Richardson, mechanical assistant to vice-president and general manager, B.&M.; G. E. McCoy, assistant general superintendent car equipment, Can. Natl.; M. F. Covert, general superintendent of equipment, refrigerator car division, General American Tank Car Corporation.

In the presentation of this report the committee proposed certain supplementary recommendations to Rules 3 and 36, covering the use of advertising on refrigerator cars and the use of the shipper's name and location on commodity and unloading cards, the latter being beneficial and permissible. The committee said, however, that the use of printing on red background should be confined exclusively to cards used in connection with explosive and other dangerous articles as required by the Interstate Commerce Commission regulations.

Action.—The report was adopted.

Economies in Cost of Billing for Foreign Freight-Car Repairs*

As instructed, your committee has made investigation of the cost of billing for foreign freight-car repairs, has considered the economies of handling this billing through a central clearing bureau, or regional clearing bureaus, as well as the matter of discontinuing billing for foreign freight-car repairs between railroads and discontinuing such billing entirely for all foreign freight-car repairs.

Central or Regional Clearing Bureaus

The survey made on the performance of December, 1932, in-

* This is a summary of the September, 1935, report of the sub-committee referred to as Exhibit B of the report of the Arbitration Committee.

dicated that the establishment of a central billing bureau would bring about immediate economies amounting to approximately $15,000 per year, and that these economies would eventually be increased to approximately $60,000 per year.

The survey made on the performance of December, 1934, indicates that the establishment of a central billing bureau at the present time would show a payroll loss at first of approximately $46,000 and that eventually this loss would be converted into a saving of $3,000 per year.

This difference is brought about by decreased costs reported in handling the billing, due to increased efficiency, improved methods and economies effected since the promulgation of the 1932 report and the adoption of recommendations contained therein.

The cost of preparing outgoing bills for December, 1934, fluctuated from $16.96 to $111.64 per $1,000 billed, the general weighted average being $30.77; and costs of checking and handling incoming bills varied from $4.51 to $35.07 per $1,000 paid, the general weighted average being $11.23. The committee feels it is probable that further economies could be effected by roads showing a high cost of billing.

From the foregoing it will be obvious that there is no economy in the establishment of a central billing bureau. On the other hand, such an organization would have some distinct disadvantages:

1—Car owner would have no means of:

(a) Locating responsibility for wrong repairs made to his equipment.

(b) Detecting roads making a practice of specializing in certain items of repairs, which may be done only by analysis of bills.

(c) Checking for guaranteed wheels and other guaranteed parts removed from his equipment on foreign lines.

(d) Checking items of repairs for so-called duplicate and time limit charges, such as renewal of journal bearings, periodic repacking of journal boxes, cleaning of air brakes, renewal of wheels and relightweighing of equipment.

(e) Checking car repair bills with the correspondence in cases of cars reported to owner for disposition under Rule 120 (owner's defects), extensively damaged cars sent home on defect cards, wreck truck applications, fire damage insurance reports or claims, and material ordered from car owner under Rule 122. All these features are directly associated with car repair billing.

(f) Checking, investigating and controlling practices at own shops through studies of accumulated billing repair cards, covering extent and character of repairs made to foreign cars and, also, the studying of charges rendered where complaints from car owners may be received as to cost of repairs billed per car day, or per one thousand miles operated.

(g) Checking cost of maintenance and/or failures of certain devices on system cars, such as certain types of roofs, doors, coupler attachments, draft gears, auto loading devices, wheels, etc.

2—The impracticability of the central billing bureau checking accident reports of individual railroads for the purpose of preventing unfair usage items being billed against car owner.

Elimination of All Billing for Freight-Car Repair

The committee has considered a deduction from the per diem and mileage rate allowances, in order to eliminate all billing. This would effect a saving of $619,680 per year. Dividing this amount among the 2,500,000 freight cars owned by railroads and private lines, the average cost of billing would be approximately 25 cents per car per year.

Offsetting the above expense, elimination of billing for repairs to foreign freight cars would have the following distinct disadvantages:

1—Although car users would, to compensate for expense of repairs to foreign cars, retain a portion of the per diem and mileage allowances therefor, unless a method were devised to check expenditures of individual roads, the urge of the user to conserve as much as possible of the said allowances would undoubtedly lead to his neglecting to perform his fair share of foreign freight-car maintenance to the detriment of such equipment.

2—This neglect of repairs to foreign cars would first become apparent at interchange points and result in a general tightening up of inspection. That, in turn, would retard the movement of cars in interchange, and to properly protect receiving lines against the delivery of under-maintained cars, it would, without question, be necessary to substantially increase the force of inspectors at interchange points.

3—The same urge by car owners (including private car lines) to neglect repairs to their own cars about to be delivered in interchange, would assert itself.

4—This incentive to neglect repairs to loaded cars would increase transfers, switching expense, detention enroute and consequent damage claims.

5—Car owners would have no means of checking responsibility for failure of repairing line to maintain owner's standards and A. A. R. requirements.

6—The use of inferior material in repairing foreign cars, would result in more frequent shopping of cars, increased maintenance, failure of cars enroute and, consequently, increase in train detentions.

7—Switching and terminal lines which do not participate in per diem or the mileage rates would have no means of clearing their car repair expense.

8—Difficulty in arranging settlement for destroyed cars, or for extensively damaged cars which handling line may desire to return to owner on account of not having proper material or facilities to make repairs, or for other reasons.

9—Study was made of one member road during the month of March, 1935, as to cost of repairs per car, per day, spent on foreign cars of fifty different ownerships. Likewise, the cost per car, per day, spent on same fifty railroads to this member's cars while on their lines. Also, the amount expended by the same member railroad per car, per mile, on repairs to cars belonging to thirty private lines. The cost of repairs to the cars of the fifty different ownerships ranged from $.3536 to $.0379 per car, per day. In the case of the thirty private lines, from $.00623 to $.00078 per car, per mile. Conversely, the cost of repairs to this member's cars on the fifty foreign lines, ranged from $1.375 to $.0314 per car, per day. These are wide variations and it must be obvious that unless there were inaugurated and made effective, some system whereby each individual railroad would be obliged to assume its fair proportion of foreign car repairs, the retention of an allowance from the per diem and mileage rates for this purpose would react to the benefit of some roads and to the detriment of others. In other words, such an arrangement would be grossly inequitable.

In order to take care of the disadvantages enumerated above, it would be necessary to provide new or revised methods and rules to govern the condition of and repairs to freight cars for the interchange of traffic, involving additional expense, in the treatment of which three important considerations were kept in mind: First, the interchange of cars must be in accordance with the safety appliance law. Second, the elimination of this billing must in no way affect the physical condition of cars interchanged from a safety standpoint. Third, the movement of cars in interchange must not be slowed up.

Summary of Additional Expenses

Summarizing the estimates to remedy, as far as practicable, the nine major disadvantages listed, we have the following additional expenses:

Disadvantages 1, 2, 3, 8 and 9	$565,553.60 per year
Disadvantage 4—	
Transferring loads (minimum)	$1,250,000.00
Loss and damage (minimum)	100,000.00
	1,350,000.00 per year
Disadvantage 5—No estimate.	
Disadvantage 6—No estimate.	
Disadvantage 7—Clerical force for switching and terminal lines	21,707.00 per year
	$1,937,260.60 per year

It is probable that the additional expenses due to Disadvantages 5 and 6 would increase the above total to at least $2,000,000 per year. The committee feels that these estimates of additional expenditures which the elimination of billing would necessitate, are conservative.

Elimination of Billing for Repairs to Foreign Freight Cars as Between Railroads Only

According to the survey made of the December, 1934, performance, 33.9 per cent of the total bills rendered was for private line accounts ($2,119,748.66 total, $718,748.18 for bills against private cars). 33.9 per cent of $36,339, which is the total saving per month for bills rendered if all billing were eliminated, is $12,318.92. Also with reference to incoming bills: 2.79 per cent of the total bills received was for private line accounts ($1,551,242.49 total, $43,299.34 for bills against private cars). 2.79 per cent of $13,233.65, which is the total saving per month for bills received if all billing were eliminated, is $369.22. Then $12,318.92 plus $369.22 equals $12,688.14, the total amount of saving by billing elimination, attributable to private cars, on the theory that the cost of billing as between privately owned cars and railroad owned cars is directly proportional to the amount of the bills.

As this calculation is based upon 96 per cent of the car ownership, 100 per cent would be $12,688.14 times $\frac{100}{96}$ equals $13,216.81 per month or $158,601.72 per year.

Then $619,680.00 (total savings per year by all billing elimination) minus $158,601.72, equals $461,078.28 the savings per year if billing for railroad owned cars only were eliminated. This is 74.4 per cent of the total of $619,680. On the assumption that the cost of the major disadvantages, $2,000,000 per annum, are apportioned on this same basis, then if billing between railroads only were eliminated, these major disadvantages would cost 74.4 per cent of $2,000,000 or $1,488,000 to produce the saving of $461,078.28.

Conclusions and Recommendations

In view of the fact that but $461,078.28 per year would be saved by eliminating billing between railroads, as compared with the minimum additional expense of $1,488,000 per year which would be necessary, and, furthermore, that but $619,680 per year would be saved by all billing elimination, as compared with the minimum annual additional expense of $2,000,000, it is the recommendation of your committee that billing for foreign freight-car repairs be continued.

The members of the Subcommittee on Economies in Connection with Cost of Billing for Foreign Freight Car Repairs, which prepared this report are: W. R. McMunn, chairman; J. E. O'Brien; J. E. Mehan; C. J. Hayes and T. J. Boring.

Couplers and Draft Gears

Draft Gears

Approval Tests.—No additional certificates of approval have been granted during the past year. An application has been received for approval of a new type of gear, specimens of which have been obtained and are undergoing tests in the A. A. R. laboratory at Purdue University. The total number of certified gears, therefore, is still nine, as listed in the latest issue of the Code of Interchange Rules.

Other Laboratory Work.—The testing laboratory has been engaged on a wide variety of work, including periodic check tests of non-harmonic springs and special trucks for the Car Construction Committee, tests designed to establish a basis for improvement in specification requirements for draft gears, and commercial tests of draft gears and springs.

Obsolete Gears.—The sub-committee is continuing to co-operate with the Committee on Prices for Labor and Materials in an effort to relegate to the obsolete class as rapidly as practicable the older and less efficient types of gears.

Standard Draft Gear.—This subject has received continued consideration. For the reasons set forth in last year's report, one standard draft gear is considered desirable but not essential, especially at this stage of development. It is probable, however, that within the next year the subcommittee will recommend adoption of requirements providing for complete physical interchangeability of approved freight car draft gears, including standardization of supports and guides for the gear.

Application of Non-Approved Gears.—It was found that one car owner was applying a non-approved type of draft gear to a lot of new cars. The secretary of the Association called the attention of the owner to Par. (1), Sec. (d) of Interchange Rule 3, which requires the application of certified gears, and the road promptly discontinued further applications and arranged to remove all the non-approved gears already applied and substitute certified gears.

Marking of Certified Gears.—A misunderstanding has arisen with respect to the proper marking of certified gears. All certificates of approval now in force have been issued under the 1931 specifications and, for this reason, most manufacturers have continued to mark their gears "A. A. R.-31," notwithstanding the fact that the present standard specifications are dated 1934. One manufacturer, however, changed the marking on his certified gear to "A. A. R.-34," when the new specifications were issued. The sub-committee has decided, inasmuch as the present specifications are dated 1934, all certified gears should be so marked. In the future, whenever changes are made in the specifications so as to require a new printing, with a corresponding change in date, the sub-committee will advise the secretary whether or not the change will necessitate any action on the part of the manufacturers of approved gears other than to change the marking. The secretary, in turn, will notify the manufacturers so that the marking at all times will agree with the latest issue of the specifications.

Revision of Specifications.—It is recommended that the present Standard Specifications for Approved Draft Gears for Freight Service, M-901-34, be revised as follows:

(a) Change Par. 11, Appendix A, to read:

"11. If a manufacturer desires to make any change in a draft gear he is marketing under a certificate of approval, he shall advise the secretary of the Mechanical Division, furnishing full information as to the nature of the proposed change and the objects expected to be accomplished thereby. This provision is intended to cover such changes as methods of assembling parts, methods of gaging parts or assemblies, methods of conditioning assembled gears, changes in metallurgy or physical characteristics of parts, and changes in design of parts, regardless of whether the adoption of these changes would result in changes in the drawings or specifications covering the parts or assemblies. If a new issue of a drawing or specification is made for the purpose of clarifying or correcting it, notice shall also be given to the secretary. The Draft Gear Committee will decide in each case what action is to be taken on these changes and, in the event they are approved, will arrange to have the records accompanying the certificate of approval changed so that these will be up-to-date at all times."

The purpose of this change is to clarify the present wording, which apparently has been misunderstood by some manufacturers.

(b) Change Par. 13, Appendix A, to read:

"13. On or before January 5th of each year the secretary of the Mechanical Division will canvass the manufacturers of approved draft gears to determine whether the record drawings and specifications of each approved draft gear are up-to-date. For the benefit of members of the Association of American Railroads a separate list of approved gears will be shown in the Interchange Rules."

Adoption of this change will place the regulations in line with what experience has shown to be the best method of handling these details. For convenience in making the yearly canvass, a form of questionnaire will be prepared for submission to each manufacturer.

(c) Add new Par. 16, to Appendix A, to read:

"16. When a certificate of approval is issued for a draft gear for which the committee does not have any previous record of service performance, this certificate shall be conditional until the service performance of the gear shall have been investigated. In order to facilitate this investigation, the manufacturers shall notify the secretary of the Mechanical Division of all sales of the gear during the period while the certificate is conditional. The Draft Gear Committee will arrange to supervise the original installation of a limited number of these gears and, after the expiration of a two-year service period, their condition will be checked in order to determine whether the conditional restrictions on the certificate may be removed."

Adoption of paragraph is recommended in order to make a distinction between gears known to give satisfactory performance and gears of an entirely new type which have no service record. Indications are that there will be no more applications for approval of service-tried gears, but that there will be applications for approval of new types of gears.

The sub-committee report on draft gears was signed by H. W. Faus, chairman; H. W. Coddington, H. I. Garcelon, L. H. Schlatter and W. Bohnstengel.

Type E Couplers

Methods Followed in Maintaining Quality and Interchangeability.—The Type E coupler has been in service long enough to obtain some service experience with it. In this connection it should be of interest to describe briefly the methods followed in order to maintain uniform high quality and strict interchangeability. The Mechanical Committee of the Coupler Manufacturers arranges with each manufacturer, two or three times each year, to submit for checking a complete coupler representing the current average production.

Each group of representative couplers submitted is inspected and completely gaged. This is followed by an interchange of knuckles, where each manufacturer's knuckle is applied and operated in all couplers. Next follows a miscellaneous interchange of parts with no two parts of the same manufacture in any one bar.

Results are tabulated on prepared forms, analyzed by each manufacturer and any adjustments made which may seem necessary.

Each group of couplers is then subjected to a physical test, usually a static tensile test or a dynamic compression (strike) test. These results are also tabulated.

This practice of periodic inspection and testing of couplers

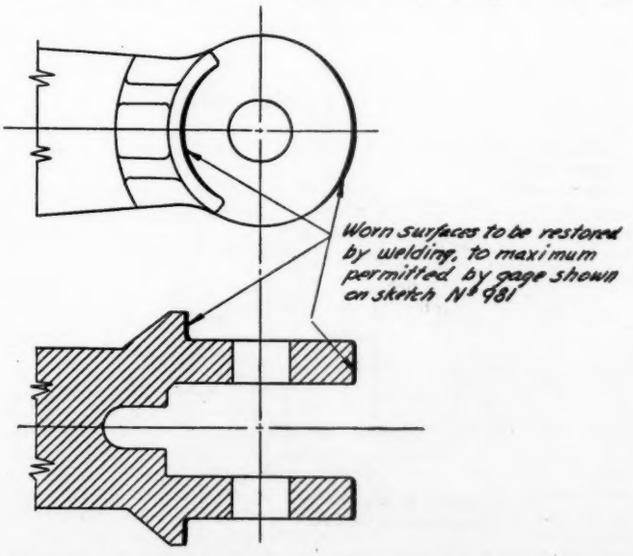


Fig. 1—Proposed method of reclaiming worn A.A.R. Standard E and Type D coupler swivel shanks

was instituted soon after the Type D coupler was adopted in 1916, and has been continued ever since.

Since adoption of the Type E coupler in 1931, there have been five groups of representative couplers submitted to the Mechanical Committee of the Coupler Manufacturers. Four groups were subjected to static tensile tests and one to a dynamic compression (strike) test. In one of the tensile test groups the couplers were provided with alternate standard swivel shanks and included representative swivel yokes. The couplers in all other groups were provided with standard rigid shanks.

[Tables giving test results which were included in the report have been omitted.—EDITOR.]

Top-Lock-Lifter Hole Caps—Application.—Some roads have reported that the cap used to close the top-lock-lifter hole in Type E bottom-operated couplers did not effectively close this opening. Investigation developed this to be due to workmen having failed to apply the cap in the proper manner. The cap has a convex surface which must be flattened down with a hammer in order to spread the inside nibs against the side of the lock lifter hole. If this practice is observed there should be no occasion for complaint about the caps not effectively closing the opening.

Bottom Rotary Lever.—It has been observed in the operation of some earlier Type E bottom-operated couplers that the rotary lever would, in the process of rotating, cant in such a manner as to produce abnormal friction between the lever and the surface upon or against which it rotates. This has been corrected and a new design presented for approval. This improvement has been approved by the Coupler Committee and bottom-operated type E couplers now produced have this new rotary lever.

Inspection and Maintenance of Draft Gears

In 1934, the committee presented a recommended practice for inspection and maintenance of draft gears and attachments by car owners. These recommendations were adopted and a number of roads have been conforming to this method which has resulted in a marked improvement in reducing free slack. The process on some other lines has not been followed so closely and the committee is urgently stressing the importance of all roads complying with this method of reducing unresisted slack. It has been suggested that observance of this recommended practice be made mandatory and at the same time provide for the attention being given on other than owned cars and setting up of interchange price for the operation. The committee is hoping to avoid such an alternative and, therefore, is urging the membership to institute the practice of reducing unresisted slack in draft gears and attachments as recommended, and shown on page 141, Sec. L of the Manual.

Type D Coupler Bodies—Discontinuing Use

In 1935 attention was directed to the action taken by the Association authorizing coupler manufacturers to dispose of patterns, core boxes, etc., relating to the production of Type D coupler bodies.

In order to protect in interchange the interest of roads using the standard E coupler, the committee recommended that the Arbitration Committee revise Rule 101 so that after January 1, 1936, a new Type D coupler body can only be applied to a foreign car at second-hand value. This rule has been effective since the first of the year, but the record of coupler sales indicate that it has not had any retarding influence upon the demand and production of Type D couplers in some territories. It is, therefore, recommended that Interchange Rule 3 be revised to read as follows:

"(c-10) Coupler, Type D, cast after August 1, 1936, prohibited, effective January 1, 1937, on all cars. In interchange."

Reclamation of Swivel-Shank Couplers

Consideration has been given to methods to be recommended in the reclamation of swivel-shank couplers to compensate for wear between buffing surfaces. This study has involved the inspection of a large number of swivel-shank couplers removed from service. A limited number of swivel-butt castings and swivel pins have also been inspected, but no vertical-plane yokes were available for this study. Consideration has also been given to inspections made of swivel-shank couplers, swivel-butt castings, vertical-plane swivel yokes and swivel pins still in service. As a result the committee recommends that the following practices be observed in the reclamation of swivel-shank couplers:

1. A.A.R. standard E and Type-D couplers having swivel shanks be

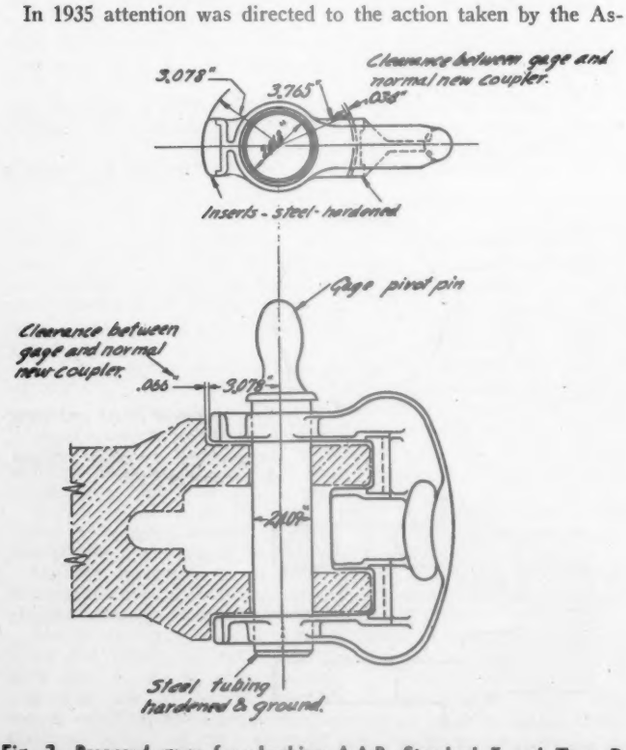


Fig. 2—Proposed gage for checking A.A.R. Standard E and Type D coupler swivel shanks after reclamation

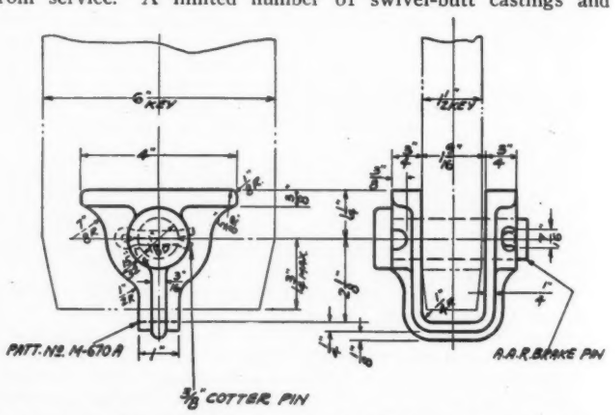


Fig. 3—Permissible substitute—Universal draft-key retainer—Universal Draft Gear Attachment Company

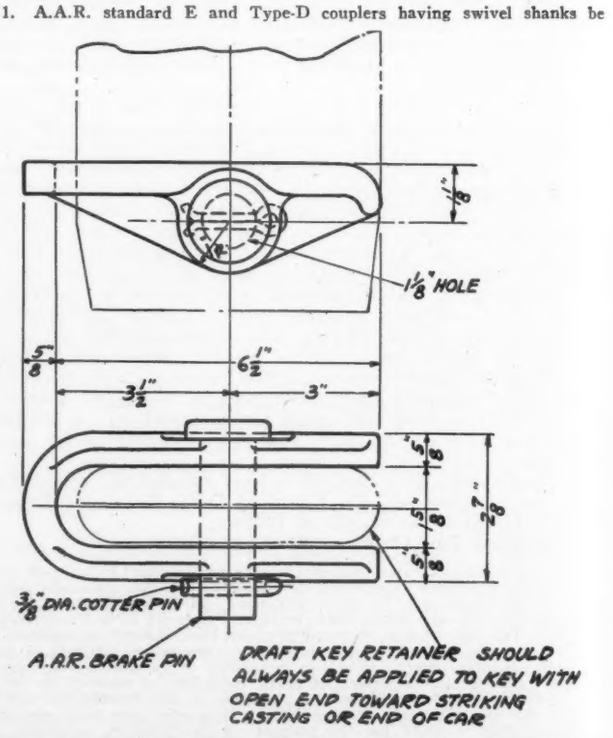

1⅛" HOLE
6½"
3½"
3"
⅜" DIA. COTTER PIN
A.A.R. BRAKE PIN
DRAFT KEY RETAINER SHOULD ALWAYS BE APPLIED TO KEY WITH OPEN END TOWARD STRIKING CASTING OR END OF CAR

Fig. 4—Permissible substitute—Surelox draft-key retainer—Western Railway Equipment Company

subject to reclamation when the free slack in the swivel joint has increased to 3/8 in.

2. Reclamation of swivel-shank couplers as covered in Item 1 be accomplished by building up, by electric or acetylene welding, the ends of the shank loops and the top and bottom front buffing shoulders of the shank an amount equal to a new coupler maximum size. Fig. 1 shows the locations where this building up process is recommended, and Fig. 2 the general design and important gaging dimensions of a suitable gage recommended for this reclamation purpose.

3. Coupler bodies that have been reclaimed in accordance with Item 2 must be re-annealed before being returned to service.

4. The difficulty of satisfactorily performing any reclamation operations on swivel pins, swivel-butt castings and swivel yokes, so far as the swiveling feature is concerned, indicates that it will be better to replace these items with new parts when too badly worn for further service.

This subject is to be given further consideration with the idea of keeping abreast of developments that might affect the reclamation practices above recommended.

Tight-Lock Couplers

Considerable interest has been expressed by roads anticipating modern passenger car construction with reference to tight-lock couplers. The coupler manufacturers have been doing some individual development along this line and your committee has requested them to give this subject their joint consideration toward finally recommending a reduced-contour-clearance coupler

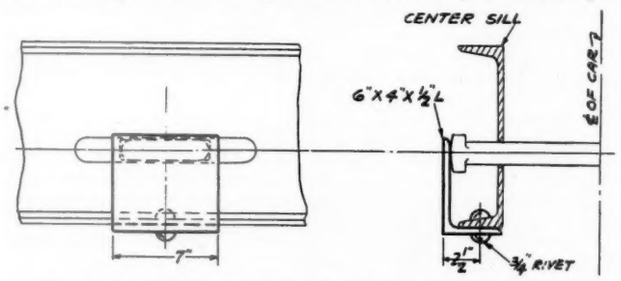


Fig. 5—Permissible substitute draft key retainer—N. & W.

or a tight-lock coupler embodying those features of design that may be necessary to provide the simplest and best arrangement of one such coupler development. A sub-committee is working with the manufacturers in connection with the development of the tight-lock coupler and it is anticipated that a design that will meet requirements will soon be presented.

Draft Key Retainer—A. A. R. Standard Approved Equivalent

Interchange Rule 3—Item 3, reads as follows:

"(3) Draft Key Retainer, A.A.R. Standard, or approved equivalent, or A.A.R. Alternate Standard one-inch diameter hair-pin type, required on all cars (equipped with horizontal draft keys) built new or rebuilt on or after March 1, 1929. Effective January 1, 1937, the foregoing requirement will also apply to all cars built prior to March 1, 1929. From owners."

Your committee has been asked to emphasize the importance of providing proper draft key retainers on account of several serious accidents having occurred due to couplers pulling out after losing the draft key as a result of non-standard draft key retaining devices. There are two types of standard draft key retaining devices shown in the Manual. The T-pin type is shown on Plate C-28-B, and 1-in. hair pin type on Plate C-28-C.

There have also been recognized as permissible substitutes for the two standard retainers the three devices shown in Figs. 3, 4 and 5.

With these various inexpensive devices available for application, and as a safeguard against accidents that have occurred where standard devices were not used, your committee recommends that the date for all cars offered in interchange to be so equipped be not extended beyond the present published date of January 1, 1937.

The report was signed by R. L. Kleine (chairman), assistant chief motive power, Penna.; H. W. Coddington (vice-chairman), engineer of tests, N. & W.; C. P. Van Gundy, engineer of tests, B. & O.; C. J. Scudder, superintendent motive power and equipment, D., L. & W.; Samuel Lynn, superintendent rolling stock, P. & L. E.; L. P. Michael, chief mechanical engineer, C. &. N. W.; C. T. Ripley, chief mechanical engineer, A., T. & S. F.

In presenting the section of the report on couplers, the committee added a recommendation for the modification of the top lock lifter on the Type D couplers to extend the anti-creep shoulder and suggested that the modified lifter be known as the Number 3 type. It further recommended that the Number 2 lifters have the anti-creep shoulder extended by application of welding, so that it may conform to the Number 3. This is to overcome the uncoupling in service, presumably due to the anti-creep feature of the top lock lifter not preventing the upward creeping of the lock. Sketches of the lock lifters and gages suitable for governing these changes in them will be included in the supplement attached to the letter ballot on the report.

Action.—The report was accepted and the recommendations referred to letter ballot.

Car Construction

The report of the Committee on Car Construction covered a variety of subjects, many of which had been assigned to sub-committees. For certain portions of the report, particularly where progress only was recorded, this abstract has been limited to a concise summary of the committee's work and its suggestions accompanying the report as Appendix A covering alternate designs for standard hopper cars.

Designs of Standard Cars

The report last year outlined the fundamental principles of the program submitted to and approved by the Mechanical Division in 1932, under which your committee since has been co-operating with the Design Committee of the American Railway Car Institute on production of designs for the principal types of freight equipment cars which represented the latest state of the art for weight, cost, construction, strength and general utility, in order that any road might adopt these designs and construct thereto their cars of the types produced.

These designs necessarily are based on the use of non-experimental materials and methods of construction. Further progress in the direction of light-weight alloy steel designs is not interfered with or retarded, however, because the fundamental characteristics thus established may be effectively and advantageously utilized thereon, this being exemplified by the fact that various builders have proceeded accordingly on new designs of light-weight alloy steel cars which have been constructed for test or interchange service.

It seems necessary, however, to repeat the following paragraph from the 1935 report:

Whether or not full advantages are to be derived from progressive standardization of freight equipment depends largely, if not almost entirely, on the attitude and the position taken from this time on by the A. A. R. in the matter of building the standard designs or the still lighter weight units in high-tensile steels or other materials based thereon when cars of these types are required.

It is not our purpose again to discuss the advantages of freight-car standardization or the soundness of the 1932 program, first, because this is a subject which all member roads now should be thoroughly familiar with, and second, for the reason that the efficiency and the economic value of the standard steel-sheathed wood-lined box car from the standpoints of "weight, cost, construction, strength and general utility" have been proved through extensometer, deflectometer and impact tests and finally, by the severe service test on the C. & O. to an extent never before undertaken or approached. It is a significant fact, however, that this steel-sheathed design is the first car to be adopted as Standard by the present A. A. R. or any of its predecessors.

Some member roads not only have supported the standard car principle by voting in the affirmative on the designs presented but have taken advantage of this work by ordering thereto new cars constructed. On the other hand, certain roads have proceeded independently as in the past, while in other cases those requiring new cars have incorporated in their own designs certain A. A. R. features such as the new standard center-sill section, bolster center filler casting, truck center-plate height and hopper and door construction, thus giving practical recognition to the fact that at least these features are preferred to their own.

In order to present an up-to-date picture of the situation with reference to the extent to which the A. A. R. standard designs have been utilized, or if preferred, the extent to which non-standard cars have been built, and keeping in mind the fact that the box car was submitted in 1932 and the 50- and 70-ton hoppers in 1935, the following summary is given, which, although not complete in all details, is substantially correct.

(Note: Summary of standard designs appears on page 294—EDITOR.)

It is not the function of your committee to promote or defend a procedure advocated by the A. A. R. executives and approved by the Mechanical Division other than to carry out instructions, and we now say that through the skill and co-operation of the A. R. C. I. Design Committee and the efforts of the Car Construction Committee, to date this has been done. The regular work of your committee, however, is becoming more voluminous, diversified and difficult, largely because of the extended activities of the new A. A. R., together with the period of transition and rapid change through which the railroad transportation industry now is passing. It appears, therefore, that we might better devote all available time and energy to current problems exclu-

Extent to Which Standard Designs Have Been Utilized

BOX AND AUTO BOX ORDERED DURING 1934

Item	Design	No. of cars
1	A. A. R. throughout	1,750
2	A. A. R. except former standard center sill, but with the 25¾-in. center-plate height	1,550
3	Former A. A. R. tentative design	250
4	Not A. A. R.	6,252
5	Miscellaneous and not investigated	12
	Total	9,814

HOPPER CARS ORDERED DURING 1934

6	Conforming closely to A. A. R. standard then in process of design	8,500
7	Light-weight alloy steel to basic A. A. R. then being designed	110
8	Not A. A. R.	1,665
9	Miscellaneous and not investigated	12
	Total	10,287

BOX AND AUTO BOX ORDERED DURING 1935

10	A. A. R. throughout	1,255
11	Not A. A. R. except center sill section and 25¾-in. truck height	510
12	A. A. R. basic design, alloy steel, light weight	2
13	Not A. A. R.	8,305
	Total	10,072

HOPPER CARS ORDERED DURING 1935

14	A. A. R. throughout	5,100
15	A. A. R. basic design, alloy steel, light weight	16
16	A. A. R. except outside stakes and height of side	475
17	Not A. A. R.	470
18	Miscellaneous and not investigated	3
	Total	6,064

BOX AND AUTO BOX ORDERED AS OF APRIL 1, 1936

19	A. A. R. throughout	300
20	A. A. R. throughout (inquiries released but orders not placed as of April 1)	1,300
21	A. A. R. except underframe with floating center sill	500
22	Not A. A. R. except center-sill section and 25¾-in. truck height	500
	Total	2,600

HOPPER CARS ORDERED AS OF APRIL 1, 1936

23	A. A. R. except pressed U side posts instead of Z bar	2,000
24	Not A. A. R. except center-sill section, bolster center filler, 25¾-in. center-plate height and unit hoppers	1,000
25	Not A. A. R.	50
	Total	3,050

FREIGHT REFRIGERATOR CARS

26	Steel-sheathed following closely A. A. R. standards for underframe, center-sill section, 25¾-in. center-plate height and side construction. However, A. A. R. work has not progressed to any great extent, and other construction details are subject to change if the Joint Committee concludes desirable	2,700

sive of the work on standard cars, rather than to pursue this activity further unless the member roads as a whole desire to support this standardization work and are prepared actually to do so by adopting and constructing the new designs when required.

Not long ago the A. R. C. I. debated this question and, upon instructions from its Board of Directors, advised us as follows:

> Having prepared, in collaboration with the Car Construction Committee, designs of the standard A. A. R. steel-sheathed wood-lined box, hoppers, steel-framed single-sheathed box and refrigerator car, it is the belief that the original assignment now has been carried out and that the Institute should be relieved of further obligations. Further, that during the period of the depression when working forces were greatly reduced, it was possible to carry on this work, though slowly, but with improvement in business conditions, and the various engineering staffs still depleted, it would be difficult so to continue.

This question now has reached the stage where it must receive renewed consideration and to this end your committee will submit in the near future to the General Committee a statement of all essential facts with request for further instructions. Meanwhile it is desirable to state that without continued co-operation of the A. R. C. I. the 1932 program no longer would be effective, since for the successful prosecution of this work, the combined skill, experience and knowledge of the following group are essential:

(1) The car builders as design and construction specialists.

(2) The railroads for the necessary knowledge of equipment operation, maintenance and utility.

(3) The specialty manufacturers for the development, production and proper installation of improved parts and appurtenances for use as desired by the purchaser.

Regardless of the decision which may be reached with respect to future standard car work, it is now advisedly stated that member roads who already have constructed freight cars to the new designs prepared under the 1932 program or have decided to adopt these designs for future needs, may be satisfied that no mistake is being made and that equipment representing the latest state of the art thus is obtained.

Standard Car Designs Being Completed

As described in detail elsewhere, we are now working, in co-operation with the A. R. C. I. on completion of designs for a steel-framed single-sheathed box and a steel-sheathed refrigerator car, but this work could not be concluded for presentation this year.

Alternate Cast-Steel Constructions for Hopper Cars

Last year we presented in Appendix A specification and complete sets of principal drawings for 50- and 70-ton nominal capacity proposed standard hopper cars which were adopted as standard.

At the same time it was stated that drawings had been released to certain specialty manufacturers for the purpose of having prepared by them, alternate designs incorporating (a) integral cast-steel underframe and hopper constructions complete, and (b) certain parts such as bolsters, interior braces and hopper door frames in cast steel. Further, that as soon as drawings, together with comparative weight had been developed, a supplement containing this information would be made available. This work now has been completed and is submitted in Appendix A to this report.

[Appendix A is made up of 20 plates of alternates to the base design—Plates 626 to 644, inclusive—which are briefly described and comparative weights of cars with the various alternates are given. The drawings include complete car constructions—50-ton and 70-ton capacity—from designs of the Unitcast Company and the General Steel Castings Corporation. In addition, there are drawings of alternate cast-steel cross-bearers, cross-ridge braces, body bolsters, side stakes and hopper frames designed by the Unitcast Company; also cast-steel center sills, underframes and hoppers designed by the General Steel Castings Corporation.—EDITOR.]

Standard Freight Refrigerator Car

During the past year the committee in co-operation with the A. R. C. I. and the Refrigerator Car Operators has been engaged in joint effort to develop a design for a ventilated refrigerator car based upon accepted fundamentals mentioned in our previous report. Preliminary designs have been prepared for study, also considerable research work has been conducted by roads represented on the committee.

Certain cars have been built and tested for insulative efficiency, air circulation and related features. Comparative tests with equal insulation are being made to determine the relative thermal efficiency of steel versus wood as an outside covering.

Recently one of the largest refrigerator-car operating companies placed an extensive order for steel-sheathed refrigerator cars of a design corresponding as closely as practicable to the general fundamentals as set forth last year, and this work should be definitely helpful in bringing this development to a successful conclusion.

The report on refrigerator cars was signed by the following subcommittee: A. H. Fetters (chairman), F. A. Isaacson, W. A. Newman, E. P. Moses and E. B. Dailey.

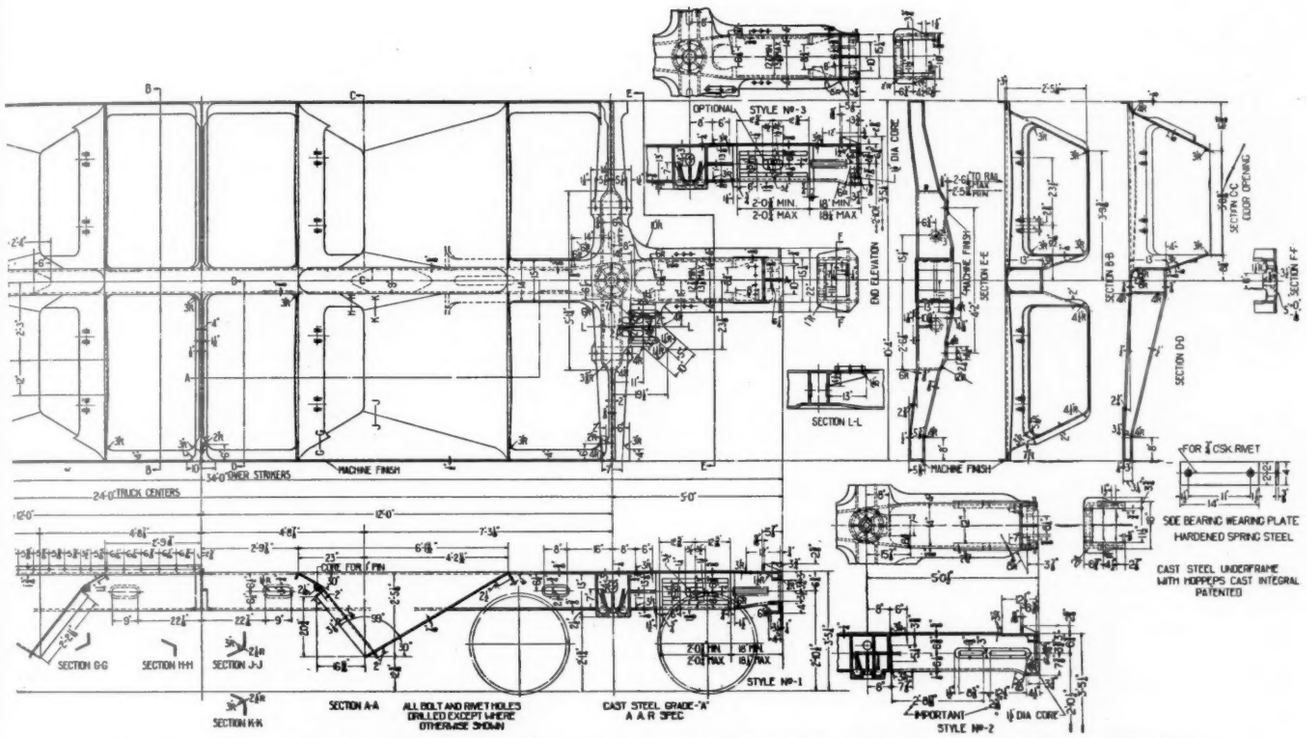
Steel-Framed Single-Sheathed Box Car

During the past year, through the joint effort of the A. R. C. I. and the Car Construction Committee, preliminary work on this design has been accomplished and although not completed, any road desiring to build a car of this type can secure sufficient data through the committee to show the fundamentals for the design now being developed. The subcommittee report on single-sheathed box car was signed by A. H. Fetters (chairman), F. A. Isaacson, W. A. Newman, E. P. Moses and E. B. Dailey.

Service Performance of A. A. R. Standard Box Car

In accordance with the plan outlined in 1935, the C. & O. has now completed a comprehensive road service test of A. A. R. standard steel-sheathed wood-lined box car No. 4 and a steel-sheathed C. & O. box car of substantially the A. A. R. tentative design of 1923. The A. A. R. car No. 4 had previously been submitted to complete deflection and severe impact tests. The C. & O. box car weighed 3,600 lb. more than the A. A. R. car and had a cubic capacity 251 cu. ft. less, due to the fact that while the length and width of both cars was the same, the C. & O. car had an inside height of 8 ft. 7½ in., and the A. A. R. car a height of 9 ft. 4 in.

The two cars, loaded to axle limit (3,600 lb. more in A. A. R. car) with bulk sand and always coupled together to insure the same treatment—although being successively placed in various positions in the train—were placed in service during June, 1934, on the C. & O. for movement between Russell, Ky., and Walbridge, Ohio, a distance of 253 miles each way. The



Alternate A. A. R. 50-ton hopper car with complete one-piece cast steel underframe—General Steel Castings Corporation

operation is northward one day and southward the next day, the cars being moved over the hump on arrival at each terminal. Accurate measurements of the cars were taken before and after completion of the tests.

The road service test did not develop any inherent defects in the construction of the A. A. R. car and it has proved its ability to perform satisfactorily under the several impacts to which it had been previously subjected, in addition to the severe usage in the nine months' road service test covering 35,407 loaded miles. Both cars have since been released into regular interchange service.

The report on the tests was signed by T. P. Irving.

Pullman-Standard Light-Weight Box Car

An experimental light-weight 50-ton box car* was built by the Pullman-Standard Car Manufacturing Company in 1935 as a contribution to the study of reducing the light-weight of box cars. The principal information desired was a determination of how much the weight could be reduced by a new design, rather extensive welding and an alloy steel without either sacrificing strength or materially affecting the price usually paid for a car of such capacity and type.

The car weighed 34,200 lb. empty, or 9,900 lb. less than a corresponding standard A. A. R. car. It was built of Cor-Ten steel and extensive welding was used, it being estimated that 22 per cent of the length of seams were arc welded, 54 per cent spot welded, and 24 per cent riveted. Truck side frames and bolsters, couplers and yokes were of light-weight design, high tensile steel. The center sill was of the same form as the A. A. R. car but of lighter section due to use of high-tensile steel. Side and end sheets were of Cor-Ten steel and lighter than the carbon steel sheets on the A. A. R. car. Couplers were of high-tensile steel but the draft gears were National M-17, the same as on the A. A. R. test car.

After being submitted to the same series of extensometer and deflectometer tests as were employed for the A. A. R. car, the Pullman car was turned over to L. W. Wallace, director of equipment research, for extensive impact tests, these also being the same as used for the standard car. In the impact tests the Pullman car was used as the struck car and a standard A. A. R. car, loaned by the N. Y. C., as the striking car.

During the impact tests over 10,000 measurements were taken. The data are being tabulated and a full report will soon be submitted to the Car Construction Committee.

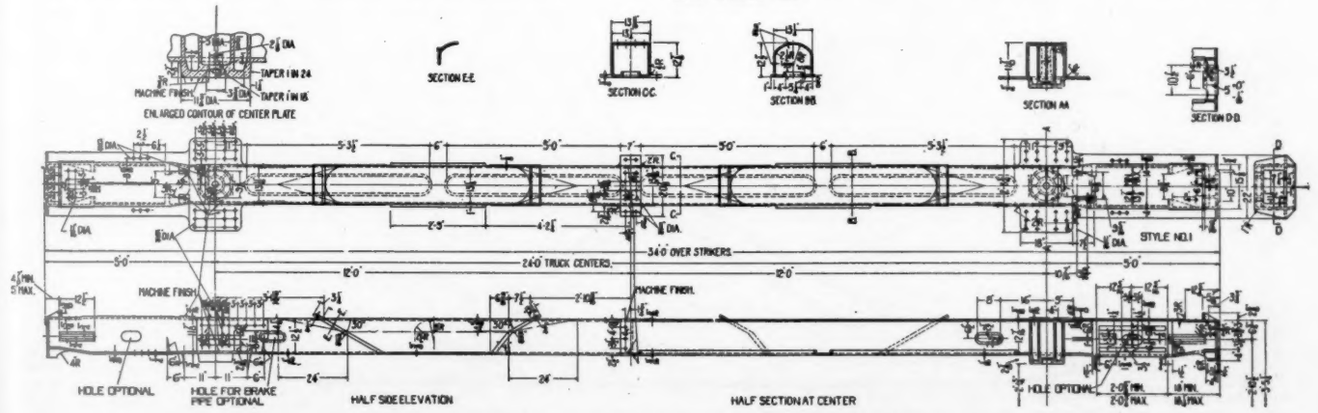
[Brief data tables covering 24 impact tests at speeds ranging from 2.7 to 16 m.p.h. accompanied the report.—Editor.]

This portion of the report was signed by L. W. Wallace.

* For description see *Railway Mechanical Engineer*, July, 1935.

Equipment Clearances and Maximum Outline

Last year we stated that the Engineering Division had been requested to revise and set up as the "Maximum Outline for Equipment in Restricted Service" the diagram adopted by the A. R. E. A. in March, 1934 and also to develop a limiting diagram for unrestricted interchange, somewhat larger than present Plate B.



Alternate cast steel center sill for A. A. R. 50-ton hopper car—General Steel Castings Corporation

Under date of March 14, 1936, we received from the Special Committee on Clearances, A. R. E. A., clearance diagrams marked Figs. 13 and 14, the former being the same as Plate B and the latter marked "Unrestricted for Main Lines."

These were reviewed and the Special Committee on Clearances was requested to consider the following changes and revise Fig. 14 accordingly if found practicable:

Increase over-all width dimension from 10 ft. 7 in. to 10 ft. 8 in., the reason being that many box and auto cars are now built to 9 ft. 2 in. clear inside width, and after making necessary allowance for minimum clearances required for door fixtures and other attachments, the over-all width of such cars is only fractionally under 10 ft. 8 in.

Indicate on the figure information outlined below:

(a) Length of car which can be built thereto; (b) whether this figure represents the outline to which new cars are to be constructed or if intended as the outline to which existing cars are to be maintained. If the former, then with multiple-wear rolled-steel wheels dimension of 4 in. above the rail should be made 5 in., and if the latter, this dimension should be made 2½ in.

Reply has not been received, therefore, progress statement only is being made. When the two figures are completed, it is the intention to have diagrams prepared, including suitable explanatory notes and submitted to letter ballot.

Truck Side Frames and Bolsters

In view of the fact that existing specifications make no provision for the use of alloy steel in side frames and bolsters, tentative requirements were prepared and approved by the Car Construction and Specification committees. These tentative requirements (included as Exhibit A of the report but omitted in this abstract) are used as a guide by the joint subcommittee in granting or withholding approval of all alloy-steel side frames and bolsters of new designs or new materials. Included among the requirements are provisions for static, dynamic and tensile tests.

It is not intended to propose adoption of these as standard requirements to be shown in the Manual, for the reason that dynamic tests are too costly as well as unnecessary for acceptance of frames by individual roads. As soon as a sufficient background of test and service experience with these new designs and materials has been accumulated, standard specifications, based upon static tests, will be prepared and submitted for adoption, as was done for frames and bolsters of carbon steel.

During the past year the manufacturers have continued their research and development work and many dynamic and static tests have been made under the supervision of your subcommittee. As a result two designs of side frames and three designs of bolsters have been approved.*

In addition, applications for approval have been received covering seven designs of side frames and six designs of bolsters.†

Approval of five designs of side frames has been withheld, either because of failure to pass satisfactory tests or because, for other reasons, the designs were considered unsatisfactory for the service intended.

Permission, limited to two car sets only, was given to apply under passenger equipment refrigerators a design of truck having bolster with lateral motion feature, but the truck is not approved for passenger service operation because the bolster arrangement is not regarded as adequate for this service.

Inquiries received from several roads with respect to spring-plankless trucks indicate misunderstanding as to the extent to which use of trucks of this type has been approved. By reference to the report for last year, it will be noted that the Four-Wheel Truck Association design of spring-plankless truck in both Grade B and alloy steel has passed satisfactory static and dynamic tests. Therefore, these designs and any others which have passed satisfactory tests are acceptable for use in interchange freight service. Additional information with respect to trucks of this general type, including certain designs not yet approved, is shown in Tables 2 and 3 of this report.

The subcommittee report was signed by H. W. Faus (chairman), T. P. Irving and T. D. Sedwick.

Non-Harmonic Truck Springs

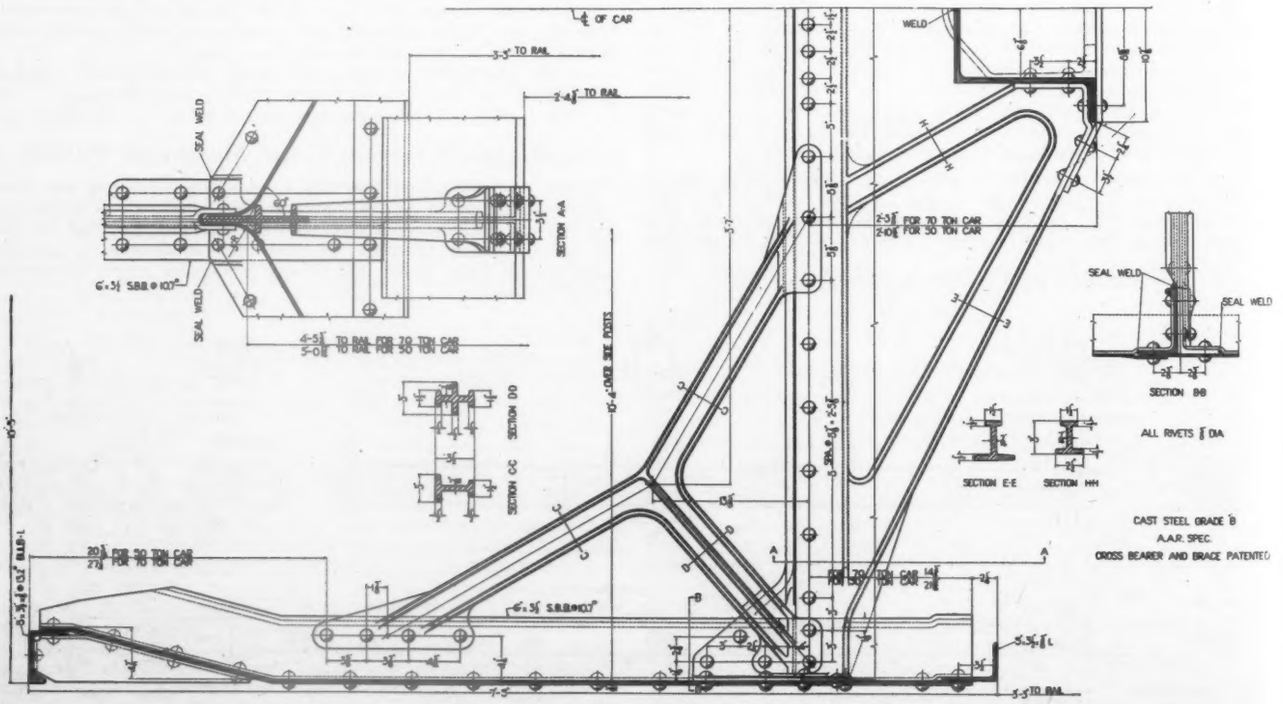
Following completion of the laboratory and road tests conducted during 1933 on devices variously designated as friction springs, snubbers and stabilizers, the devices were placed in service, two car sets of each, under General American Transportation Company refrigerator cars to obtain comparative information as to endurance qualities.

The endurance test is now nearing completion. In order not to prolong these tests unduly, it was decided to remove all springs and special trucks as soon as practicable after the cars to which they were applied had accumulated 50,000 service miles. By December 31, 1935, 15 of the 25 car sets had been removed for the above reason or because of failure. On that date each manufacturer of devices included in the test was furnished with a summary of the results of the tests of his own device up to that time. On April 20 seven car sets remained in the test but the probability is that all will be removed and tests closed by June 1.

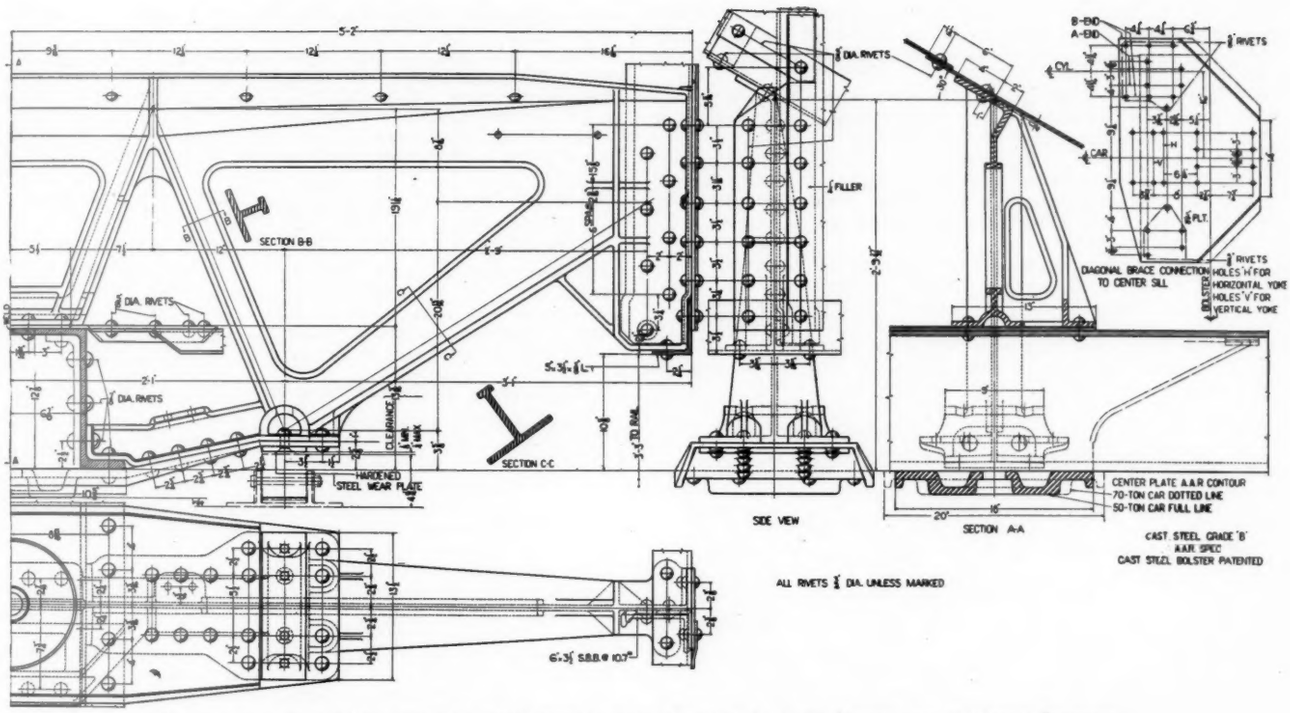
As soon as possible after the remaining springs and devices have been examined and calibrated, a final report will be prepared.

* Table marked No. 2 accompanying the report gave information covering Gould and American Steel Foundries side frames, also bolsters submitted by the Pressed Steel Car Company, Gould, and Buckeye, all of alloy steels. The table also showed applications made.

† Table marked No. 3 accompanying the report included information relative to side frames submitted by the Pressed Steel Car Company, National Malleable & Steel Castings Company, American Steel Foundries, and Standard Car Truck Company; also bolsters submitted by National Malleable & Steel Castings Company, Buckeye, and Standard Car Truck Company. This table also listed applications made.



Alternate cast steel crossbearer and cross ridge brace for A. A. R. hopper cars—Unitcast Company


SECTION B-B
SECTION C-C
HARDENED STEEL WEAR PLATE
SIDE VIEW
SECTION A-A
ALL RIVETS ¾ DIA. UNLESS MARKED
CENTER PLATE A.A.R. CONTOUR
70-TON CAR DOTTED LINE
50-TON CAR FULL LINE
CAST STEEL GRADE 'B' A.A.R. SPEC.
CAST STEEL BOLSTER PATENTED
DIAGONAL BRACE CONNECTION TO CENTER SILL
HOLES 'H' FOR HORIZONTAL YOKE
HOLES 'V' FOR VERTICAL YOKE

Alternate cast steel bolster assembly with integral center plate for A. A. R. hopper cars—Unitcast Company

The subcommittee report was signed by F. A. Isaacson (chairman), T. P. Irving and H. W. Faus.

Helical Truck Springs

In the 1932 report, designs of helical springs for 40-, 50-, and 70-ton nominal capacity trucks were included and were later submitted to letter ballot and adopted as recommended practice. These designs were prepared to meet maximum loading and service conditions, to eliminate the continual expense of replacing broken springs, and were to be made of plain carbon steel to the then existing A. A. R. material specifications, being designed to interchange in the space occupied by the then A. A. R. standard spring groups and were based on no inactive coils and a modulus of torsion of 12,600,000 lb. per sq. in.

In 1933 revised specification M-114-34 for heat-treated carbon-steel springs was prepared, submitted to letter ballot and adopted as recommended practice. These specifications include a provision requiring the use of a modulus of torsion of 10,500,000 lb. per sq. in. and 1½ inactive coils.

The principal reasons, at this time, for preparing new designs, to replace the springs adopted in 1932, are as follows:

1—To utilize a better grade of material than now obtainable under revised specification M-114-34.
2—To provide more capacity than the 1915 design but somewhat less than the 1932 springs.
3—Based on information obtained from tests made since 1932, the new designs will result in lower impact forces being delivered into trucks and bodies as well as to the lading in the cars.
4—The new springs adapt themselves more readily in groups, such as Dalman and Double Truss, and also are designed to function more satisfactorily in conjunction with non-harmonic spring devices.
5—The new springs, having greater capacity and more reserve travel while having practically the same total deflection as the 1915 springs, are designed to meet maximum load conditions and at the same time resist breakage in present-day service.

The proposed springs are somewhat more expensive than the 1915 or 1932 in plain carbon steel because of the higher costs of both materials and fabrication. However, for reasons enumerated above, it is evident from the experience and test information available that a change from the 1932 design is advisable and it is believed that the better performance characteristics will fully justify this change from an economic standpoint.

The subcommittee has prepared and now submits designs for the 40-, 50-, 70-, and 100-ton nominal capacity trucks, to be designated as Classes C-2, D-2, H-2, and P-2, to replace the C, D, and H springs now in the Manual and to provide a new design for the P-2 spring. All new springs interchange in the spaces now provided on present A. A. R. groups.

The non-patented spring plates shown on the drawings are designed to eliminate spring bolts used with former designs. These plates are 3/16 in. thick and the overall free height of spring and plates is increased ⅛ in. over the 1932 design. Other spring plates may be used provided they are of equivalent strength and interchangeable with the spring plates shown.

[Tabulated statements of comparative costs, design and capacity characteristics of the old 1915, present standard 1932, and proposed 1936 designs for truck springs on 40-ton, 50-ton, 70-ton and 100-ton freight cars was appended as information. Four drawings of the proposed classes C-2, D-2, H-2 and P-2 springs for freight car trucks with 5 in. by 9 in., 5½ in. by 10 in., 6 in. by 11 in. and 6½ in. by 12 in. axles were also included.—EDITOR.]

The following recommendations are made:

1—That new designs C-2, D-2, and H-2, be submitted to letter ballot for adoption as recommended practice for use in place of springs, C, D, and H, now in the Manual.

2—That new design P-2 be submitted to letter ballot for adoption as recommended practice.

The subcommittee report was signed by T. P. Irving (chairman), H. W. Faus and F. A. Isaacson.

Truck Spring Planks

A progress report including preliminary recommendations was included in the report last year.

Further study has shown that spring planks of various designs are causing trouble and that spring planks applied to cars as recently as 1934 are cracking and breaking. Among apparent causes of failure may be cited the following:

1—Insufficient flexibility.
2—Method of attachment to side frames.
3—General design.
4—Method of fabrication.
5—Material.
6—Irregularities in application.

Spring planks in use today are of so many designs and types, and so few facts were available as to the actual service performance of most of these, that your subcommittee came to the conclusion that more information would have to be obtained. Therefore, a questionnaire designed to obtain detailed records of spring-plank failures for 1934 and 1935 was sent to a representative list of railroads and car owners. When replies have been received, the subcommittee proposes to analyze the data and hopes to be able to submit definite recommendations next year.

The Engineers' Committee of the Four-Wheel Truck Association has co-operated in this investigation. The subcommitee report was signed by F. A. Isaacson (chairman), T. P. Irving, W. A. Newman and H. W. Faus.

Rail Car Motor Axles

In view of the then increasing use of rail motor cars for branch line or local main line train service, the larger and progressively heavier units introduced for these services and the fact that the motor axles necessarily were of dimensions differing in some respect from A. A. R. standards, your committee undertook during 1929, a study in an effort to prevent the intro-

duction of various designs and to provide axles of proper capacities, thus avoiding the tendency towards over-loads and controversies as to capacities and designs of motor axles which should be used under given load conditions.

A subcommittee was appointed from representatives of the then American Electric Railway Engineering Association (now American Transit Association) and the then A. R. A. Car Construction Committee for this purpose and in 1930, tentative recommendations were made pending the results of further investigations. These included a list of axles in sizes from 3¾ in. by 7 in. to 6½ in. by 12 in., inclusive, designated as E-9 to E-13, together with capacities.

Since the work was started the situation has changed somewhat in that specially designed high-powered motorized trains for high-speed main line service have been introduced on various railroads, the use of which may be expected to increase. It is therefore desired to state that the work here outlined and on which final report now is made, pertains only to the original problem of motor axles for rail cars used in branch line or local train service and not to the high-speed motorized train equipment now in use or in cars under development.

It is believed, however, that designs and specifications for the first mentioned type of equipment should be provided for in the recommended practices because comparatively large numbers of such cars still are in use with the prospect or possibility of future increase.

The report for 1934 stated that Rolling Stock Committee No. 1 of the American Transit Engineering Association had then made final and complete report with recommendations as published by the A. T. A. in the 1933 Supplement to the Engineering Manual Sec. E 3-33, under heading "Designs of Axles for Electric Railway Motors." These recommendations received the approval of the American Transit Association.

The 1935 report of your committee stated that the A. A. R. Committee on Specifications for Materials had been requested to check the A. T. A. specifications against those of the A. A. R. for passenger service axle materials and to advise what specification should be followed for rail car motor axles. This has now been done and it is proposed to incorporate in the Manual the following:

[Accompanying the report was a "recommended practice" covering motor axles for gas-electric and similar types of heavy traction rail motor cars which specifies the materials to be used. —EDITOR.]

Passenger Equipment Axles

During the past year your committee has been instructed to investigate certain failures of axles in passenger service, particularly drive axles for air-conditioning equipment. A joint subcommittee has been appointed consisting of representatives from Wheels, Material Specifications and Car Construction committees.

Information has been obtained from a number of roads on failures of this nature. Studies thus far made indicate that the bending effects from generator pulley action cause only small increases in the axle stresses, whereas the added load of air-conditioning equipment has, in some cases, increased the unit stresses to a point rather close to safe capacity. It is also evident that improper mounting of the generator pulley and poor workmanship may contribute to such failures.

Since receiving original instructions, this assignment has been broadened to include all axles for passenger equipment cars, together with the effects of operating changes, such as increased weights and speeds. This is a broad and intricate subject which will require much further study and research before definite conclusions can be reached. Therefore, a progress report only is submitted.

The subcommittee report on axles for rail motor and passenger cars was signed by B. S. Brown (chairman), K. F. Nystrom and T. P. Irving.

Container Car Design

Last March your committee was instructed to produce a design of container car in accordance with a brief specification from the Federal Co-ordinator of Transportation, work to be completed with a specification by May 15.

Work was undertaken with the understanding that the car desired is of new and experimental character and in view of the absence of experience, work was confined to features of safety and suitability for operation in interchange.

Tentative specifications called for containers of 2,500 lb. tare weight and a load capacity 24,000 lb., containers to consist of fully enclosed boxes mounted on two skid rails spaced not less than 48 in. or more than 54 in. center to center and with clear height not less than 4 in. from bottom of skid to container base.

The car was to be designed to carry five containers and have a light weight of 36,500 lb. Plans were made for a car of Cor-Ten steel construction but due to limited time to work out the design the calculated weight was 44,700 lb. By further study it probably would be possible to reduce the weight to the desired 36,500 lb.

Work was finished and drawings submitted to the Co-ordinator's organization on May 15. A copy of the general drawing with descriptive specification may be obtained by request from the secretary.

The special committee report was signed by P. W. Kiefer (chairman), T. P. Irving, B. S. Brown, H. E. Myers, and H. L. Holland.

Door Fixtures

In last year's report it was stated that a subcommittee had been appointed to check over the door fixture standards now shown in the Manual, for the purpose of eliminating older and obsolete details. This work has not been completed and therefore, progress only may be reported this year.

The subcommittee report was signed by F. A. Isaacson.

Lettering and Marking for Automobile Cars

Development of new designs of automobiles and frequent changes in existing models have necessitated corresponding alterations in automobile loading equipment as installed in automobile box cars.

These changing conditions are met in some cases by complete new installations of loading racks and in other instances by modifications in existing loading equipment. This results in having concurrently in service a number of different styles of loading equipment and obviously requires additional and corresponding designating markings for identification of cars at terminals and in transportation yards.

In order to protect this situation a system of identification marking has been developed and now is utilized almost universally by roads owning or operating automobile cars.

[Accompanying the report were eight illustrations showing modifications of the present standard white stripe painted on the car doors to indicate installation of loaders. The modifications consist of rectangular blocks below the white line together with letters or figures to indicate type of loader.—EDITOR.]

The foregoing supplements information contained in Note 13 appearing on Fig. 1, between pages 40 and 41, Sec. L of the Manual, and it is recommended that same be shown on a new sheet to be inserted in the Manual immediately following present Fig. 1, and that Note 13 be revised to include suitable reference to additional marking.

Load Limits and Wheel Designs

Interchange Rule 86—The question of stencilled load-limit capacities on freight cars, particularly hoppers, taking into account the various weights of wheels having been raised, a subcommittee was appointed to study the question.

This question was prompted by a feeling that present load-limit ratings discriminated against the use of the heavier wheels; further, that since a rail load-limit capacity has been based on axle capacity, the rail load-limit capacity could be raised somewhat when cast-iron wheels are used.

After an analysis of axle stresses and moments, your subcommittee submits a proposed revision for Interchange Rule 86.

[The report includes stress analyses and a revised axle drawing with new and limit-of-wear dimensions. Two groups of wheels are shown—"heavy" and "light." For "heavy" wheels load limits have been increased for several axles.—EDITOR.]

The following wheels are considered as "heavy":

Cast iron.
Multiple-wear wrought steel, outside rim from new to 1⅝ in. thick.
Two-wear wrought steel, outside rim from new to 1⅝ in. thick.
Heavy-service cast steel, outside rim from new to 1⅝ in. thick.
Three pairs of any of the above wheel and one pair of others.

The wheels listed as "light" are:

One-wear wrought steel.
One-wear cast steel.
Multiple-wear, also two-wear wrought steel and heavy-service cast-steel wheels having outside rim below 1⅝ in. to scrap limit of the wheel.

The proposed revision of Rule 86 requires the following increases in axle capacities and total rail loads for four-wheel trucks having "heavy" wheels—no changes are proposed where "light" wheels are used:

Axle size	Axle capacity, lb.		Total rail load, lb.	
	Light wheels	Heavy wheels	Light wheels	Heavy wheels
5 in. by 9 in.	32,000	32,250	136,000	137,000
5½ in. by 10 in.	40,000	40,500	169,000	171,000
6 in. by 11 in.	50,000	50,500	210,000	212,000

The subcommittee report was signed by B. S. Brown (chairman), K. F. Nystrom and T. P. Irving.

Definitions and Designating Letters for Freight Cars

Requests have been made for new recommended practice designating symbols and definition to cover a beverage refrigerator

car, without ice bunkers and equipped with two or more fixed tanks for transporting beverages or other liquids in bulk.

The following new definition and symbols are recommended:

"RBT"—Beverage Container Refrigerator. Similar in design to "RS" type, but with no ice bunkers. Provided with two or more fixed tanks for transporting beverages or other liquids in bulk. With or without means of ventilation.

The subcommittee report was signed by C. E. Adams.

New Designs of Light-Weight Freight Cars

Interchange Rule 3—In addition to the work of the joint subcommittee on Side Frames and Bolsters for Freight Car Trucks, as covered elsewhere, and numerous proposed installations of auxiliary brake beam support and bottom rod guard installations submitted during the past year for review and disposition, the full committee has been called upon to check for approval or other disposition, some 20 designs of freight cars complete for interchange service, listed below as information:

Still another problem which came to us was the design of a container car for the Federal Co-ordinator of Transportation.

This section of the report serves as an illustration of the progressive increase in our activities.

BESSEMER & LAKE ERIE

(1) Light weight 55-ton nominal capacity alloy-steel hopper car. Design of body approved immediately but release on light-weight alloy-steel truck side frames withheld pending tests under dynamic loading.

Quenched and tempered hollow bored axles not approved.

Follows closely A. A. R. design. 100 cars.

(2) Light-weight 70-ton nominal capacity hopper car with standard type truck frames of Grade B steel. Approved.

Follows closely A. A. R. design. 1,000 cars.

(3) Light-weight 90-ton nominal capacity hopper car with standard type truck frames of Grade B steel. Approved.

Follows closely A. A. R. design. 1,000 cars.

C. B. & Q. AND P. & L. E.

(4) Item (1) applies also to five experimental cars each for these roads except that A. A. R. standard axles were used under the P. & L. E. cars, therefore, both lots approved except C. B. & Q. axles.

PACIFIC FRUIT EXPRESS

(5) Steel-sheathed wood-lined 40-ton capacity refrigerator following closely design of A. A. R. standard as thus far developed. Approved. 2,700 cars.

NORFOLK & WESTERN

(6) Light-weight 57½-ton nominal capacity hopper car. Approved. Not A. A. R. standard but standard center sill section, bolster center filler castings, truck center plate height and unit hoppers used. 1,000 cars.

E. J. & E.

(7) Light-weight alloy-steel 70-ton nominal capacity hopper car. Approved. Follows closely A. A. R. design.

P. R. R.

(8) Hopper car for bulk cement loading, 70-tons nominal capacity. Approved. This is a special car for which no A. A. R. design is available.

C. & O.

(9) Alloy-steel light-weight 50-ton nominal capacity hopper car. Approved. Follows closely A. A. R. design. 15 cars.

UNION R. R.

(10) Gondola car of 70-tons nominal capacity. General design approved but with request that center sill rail clearance be checked further and changed if necessary. Approval of trucks withheld pending advice as to whether the side frames are to be of Grade B carbon or alloy steel.

No A. A. R. design available. 1,000 cars.

GENERAL AMERICAN REFRIGERATOR EXPRESS CO.

(11) Special type heavily insulated self-clearing permanently enclosed car for handling bulk sugar and similar commodities. Approved. No A. A. R. design available.

MATHER STOCK CAR COMPANY

(12) Multi-purpose gondola car, 40-tons nominal capacity. Not approved account character of side construction.

N. Y. N. H. & H.

(13) Container car designed for use with the "Roloff" type container. Being checked further with the railroad at the time of writing this report.

BETHLEHEM STEEL COMPANY

(14) Welded underframe flat car, 70-tons nominal capacity. Approved. No corresponding A. A. R. design available.

PULLMAN-STANDARD CAR MFG. CO.

(15) Light-weight alloy-steel box car, 50-tons nominal capacity. Approved. Doors, ends and roofs of builder's alternate designs. Otherwise, conforms closely to A. A. R. design. One car.

MOUNT VERNON CAR MFG. CO.

(16) Light-weight refrigerator car, 50-ton nominal capacity for experimental service. Steel underframe and superstructure framing of alloy steel with plywood paneled siding and ply-metal panel lining and ceiling. A. A. R. standard Z bar center sill section and 25¾ in. center plate height. Not A. A. R. standard.

(17) Light-weight steel-sheathed box car, 50-tons nominal capacity. Approved. A. A. R. standard in alloy steel including base doors, ends and roof.

GENERAL AMERICAN TANK CAR CORP.

(18) All-steel milk car, 50-tons nominal capacity, having two 3,000 gal. capacity tanks. Approved. No corresponding A. A. R. standard.

RUSTLESS IRON CORPORATION

(19) Light-weight alloy-steel hopper car of 50-tons nominal capacity. Approved. Center sills, bolsters, cross bearers with cross ridge brace arrangement and door frames of cast steel to A. A. R. alternate design. Follows closely A. A. R. design. One car.

COORDINATED TRANSPORTATION, INC.

(20) Convertible sectional railway box car for experimental service. General scheme checked and no features were found which would raise question regarding safety and suitability for interchange service insofar as the design had been developed. Consequently no action necessary. No corresponding A. A. R. design.

AMERICAN CAR & FOUNDRY CO.

(21) Six designs of multiple-unit tank car underframes. Approved insofar as underframes, running gear and other features not included in the Tank Car Specifications, are concerned. No corresponding A. A. R. standard.

Letter Ballot Items

It is recommended that the following items contained in this report be submitted to letter ballot of the members:

1. Designs for helical truck springs for freight car trucks. Recommended practice.
2. Designs for electric traction motor axles suitable for gas-electric and similar types of heavy rail motor cars. Recommended practice.
3. Lettering and marking for automobile rack cars. Standard practice.
4. Revision of Interchange Rule 86 for adjustment of rail load-limit capacities to compensate for the various weight wheels now in general use. Standard practice.
5. Definitions and designating letters for freight cars. Recommended practice.

The report of the Committee on Car Construction was signed by P. W. Kiefer (chairman), chief engineer motive power and rolling stock, N. Y. C.; T. P. Irving (vice-chairman), engineer car construction, C. & O.; W. A. Newman, chief mechanical engineer, Can. Pac.; A. H. Fetters, general mechanical engineer, U. P.; J. McMullen, superintendent car department, Erie; F. A. Isaacson, engineer car construction, A. T. & S. F.; G. S. Goodwin, assistant general superintendent motive power, C., R. I. & P.; E. B. Dailey, engineer car construction, S. P.; B. S. Brown, general foreman, Penna.; K. F. Nystrom, superintendent car department, C., M., St. P. & P.; H. E. Myers, master car builder, L. V., and H. L. Holland, assistant engineer, B. & O.

Discussion

The committee's very evident discouragement at the small practical results, in the form of cars actually built to the standard designs on which both it and the Design Committee of the American Railway Car Institute have devoted so much effort, drew out a lively discussion. It was the wish of those who spoke that the standardization work of the committee be continued so that new developments can be taken into consideration just as fast as practicable, and the standards kept up to date, according to the plan on which the committee is working. Several speakers stressed the quality of the designs resulting from

the joint effort of the best talent of both the railroads' and car builders' designers—which no railroad working alone can hope to equal. It was suggested by C. T. Ripley (Atchison, Topeka & Santa Fe) that perhaps the Mechanical Division should bring the matter before the railway executives. In agreeing with this, F. H. Hardin (New York Central) moved that the subject be brought before J. M. Symes, vice-president in charge of the Operations and Maintenance department of the Association of American Railroads, with the request that he lay it before the Executive committee and the board of directors. The motion was carried.

Action—The report was approved and the proposed revision of Rule 86 ordered referred to the Arbitration Committee before being submitted to letter ballot. The committee was accorded a standing vote of thanks.

Locomotive Construction

The committee on Locomotive Construction has, during the year, given consideration to the following 12 subjects:

A—Design of fundamental parts of locomotives: (1) Universal joints for operating rods of cab valves, injectors, etc.; (2) Driving wheel centers of thin-wall section type; (3) Safety valves for locomotives; (4) Light-weight pistons.

B—Pins and bushings for brake and spring rigging on locomotives and tenders.

C—Roller bearings for locomotives and tenders.

D—Driving and trailer tires.

E—Exhaust steam injectors.

F—Development and use of oil electric locomotives.

G—Pipe fittings for 300 lb. pressure.

H—Revision of Master Mechanics locomotive front end arrangement adopted in 1906—revised 1936.

I—Standardization of valves.

It is recommended that the following four subjects be submitted to Letter Ballot for adoption as Recommended Practice:

(1)—Universal joints for operating rods of cab valves, injectors, etc.

(2)—Pins and bushings for brake and spring rigging of locomotives and tenders.

(3)—45 deg. and 90 deg. street ell fittings for 300 lb. pressure.

(4)—Revision of Master Mechanics front end arrangement adopted in 1906.

Report has been submitted by L. W. Wallace, Director of Equipment Research, outlining a proposed program for investigation of materials, etc., entering into the construction of locomotive boilers. This proposed program of research is being studied by the committee, and report, with their recommendations, will be transmitted to the Director of Equipment Research when their investigation is completed.

Upon direction from the General Committee, the committee has been giving consideration to the construction of locomotive boilers by the fusion welding process. The committee has also cooperated with G. S. Edmonds, superintendent motive power, D. & H., in connection with the design of a fusion-welded boiler authorized for construction by that company. The design and specifications for this boiler have been approved in a report to the General Committee.

Universal Joints for Valve Operating Rods

After studying the design of universal joints used by various roads for the operation of cab valves on locomotives, as well as those for injectors, your committee recommends, for locomotive use, universal joints composed of two jaw members and a center piece as shown in Figs. 1 to 4, inclusive.

[In addition to detail drawings and tables which are omitted in this abstract, the report showed various combinations and applications of the joints in Figs. 5 to 7, incl.—Editor.]

The subcommittee report was signed by H. H. Lanning (chairman), Geo. McCormick, C. Harter, D. S. Ellis, and A. H. Fetters.

Driving Wheel Centers with Thin Walls

In 1934 and 1935, your committee included a statement of roads which had applied driving wheel centers of the thin-wall section type and gave information as to diameter of wheels, type of locomotives, etc., on which these were in use. This statement has been brought up-to-date as of March 1, 1936, and is herewith submitted. The tabulation shows that since the last report there has been a total increase of all makes of thin-wall driving wheels of 500.

[Tabulated data showed applications to date of 342 wheel centers of the Scullin type to 146 locomotives on 15 roads, 854 of the Boxpok type to 208 locomotives on 19 roads, 16 of the box type (L. M. F. design) on six A. T. & S. F. locomotives, four of the Birdsboro type on two B. & A. locomotives, two of Univan type on a B. & O. locomotive and 12 of the Duquesne type on six Penna. locomotives.—Editor.]

Inquiry as to the service rendered by different types of special wheel centers has been made of the roads using them and your committee finds that, with few exceptions, the service rendered is satisfactory. A few defects have been reported but were said to be of a nature common to steel castings and the number smaller than would be expected of an equal number of steel castings of ordinary design. The defects in most cases have been confined to original designs. Manufacturers have made improvements and reinforcement in design, with no trouble reported on latest types.

While marked progress has been made in the application of special design of wheel centers, nine roads express the opinion that this type is still regarded as in the experimental stage, while nine other roads consider it as past the experimental stage, with four roads non-committal. In view of this division of opinions, the committee offers no definite conclusions or recommendations.

The subcommittee report was signed by H. H. Lanning (chairman), Geo. McCormick, C. Harter, D. S. Ellis, and A. H. Fetters.

Safety Valves

In 1934, your committee rendered a progress report on safety valves which evoked some criticism with regard to the material, viz., brass, which was specified for safety valve sleeves also with regard to the methods recommended for determining the aggregate discharge capacity of safety valves for any particular locomotive boiler.

In view of the criticism with respect to materials for sleeves to be used in applying safety valves to locomotive boilers, the committee wishes to revise par. 13 of the 1934 progress report to read as follows:

"Safety valves shall be of the female type and applied to suitable sleeves of brass or steel, the sleeves to be screwed into the boiler or steam dome. Threads of safety valve bases and sleeves are to conform to the railway company's standards."

In criticizing the formula for obtaining the aggregate safety valve capacity, viz.:

5.75 × Heating surface (sq. ft.) = Required aggregate discharge capacity

some expressed the belief that this would give values entirely too low for compliance with I. C. C. Rule 34, which provides for a rise of not more than 5 per cent above the allowed steam pressure.

An evaporation rate of 5.75 lb. of water per square foot of heating surface has been used for years by some of the larger manufacturers of safety valves, and experience with valves proportioned according to this formula has demonstrated that they afford sufficient relieving capacity for boilers of ordinary construction.

Safety valve requirements for locomotive service differ from those in stationary service in that the rates of draft and combustion, under maximum working conditions, are directly proportional to the steam consumption of the cylinders, whereas in stationary service draft is generally produced independently of steam consumption and there is no automatic relation between consumption and the rate of combustion. In a locomotive boiler, therefore, it is only necessary to provide sufficient safety valve capacity to discharge the steam which can be generated over and above the output to cylinders and auxiliaries, whereas in stationary service it is frequently necessary to provide for the maximum evaporative capacity of the boiler.

Conditions under which the amount of steam to be handled by the safety valves of a locomotive becomes maximum seem to be realized in a coal-burning locomotive when the engine is stopped suddenly after running for a considerable period under conditions which require the maximum rate of combustion. Under these conditions, the radiant heat from the fire maintains, for a short period, a rate of evaporation that may, and probably does, approximate the evaporation attained under working conditions; hence the need for special consideration and possibly tests to determine the correct safety valve capacity for a boiler having unusually large grate area.

In an oil-burning locomotive under the same conditions, the cessation of draft which accompanies the closing of the throttle automatically reduces the rate of combustion, as well as the firebox temperature, and compels an immediate reduction in the rate at which fuel is supplied to the firebox; hence in oil-burning service the maximum steam generation to be considered in determining safety valve capacity is that which can be maintained when the fire is forced by the blower with steam from an outside source and all steam outlets from the boiler are closed.

In recognition of the fact that many locomotives constructed during recent years have been provided with boilers having unusually large grates and fireboxes, the committee qualified its

recommendation by including the following paragraph in the 1934 report:

"For boilers having large grate area or short flues, the evaporative capacity should be calculated according to the formulae commonly used for determining boiler capacity in connection with steam consumption of locomotive cylinders, and, in cases of doubt or boilers of unusual construction, the evaporative capacity should be determined by actual test."

If there is any error in the above recommendation regarding boilers of unusual construction, the error lies in the statement that the evaporative capacity of boilers having large grates or short flues "should be calculated according to the formulae commonly used for determining boiler capacity in connection with steam consumption of locomotive cylinders." It is extremely doubtful whether there exist any locomotives which would require safety valves of sufficient capacity to discharge as much steam as would be indicated by the application of Cole's ratios; hence the committee now suggests that the word "may" be substituted for the word "should" in the second line of the above quoted recommendation.

The committee has given consideration to the possibility of standardizing the working parts of safety valves but has reached the conclusion that, in view of the patent situation involved, the recommendations given in the 1934 report with regard to dimensions and construction are all that should be considered at this time.

The subcommittee report was signed by H. H. Lanning (chairman), Geo. McCormick, C. Harter, D. S. Ellis, and A. H. Fetters, Sub-Committee.

Light-Weight Pistons

The 1934 report included a statement of roads which had applied light-weight pistons of the type in which the packing rings perform the function of a bull ring and carry the weight of the piston. This statement gave data as to the number of locomotives equipped, type of locomotive, cylinder dimensions, average mileage per month, etc. This statement has been brought up to date as of March 1, 1936, insofar as replies have been received, and is included as Statement "A."

[Statement "A" which includes 4,022 locomotives on 10 roads has been omitted.—EDITOR]

The Canadian National now has 602 locomotives equipped with the design shown as Fig. 1 in the 1934 report, no changes having been made in the design but the application of such light-weight pistons has been extended.

The D. & R.G.W. now has 70 locomotives equipped with the design shown as Fig. 4, the only change being the abandonment of the bull ring and the adoption of a one-piece nickel-steel piston.

At least three roads, the B. & M., L.V., and C. & O. have, during the past year, applied pistons developed by the Hunt-Spiller Company. These pistons are of the conical type but the spider and bull ring have been combined in an integral casting of gun iron. The packing rings are of a special sectional design, the segments being forced outward in contact with the cylinder walls by hooplike flat steel springs.

The pistons in the streamlined 4-6-4 type locomotive, Commodore Vanderbilt of the New York Central, are of interest because of the extremely light design made possible by the use of high-tensile steel. The construction of this piston is illustrated herewith. While equipped with these pistons the Commodore Vanderbilt had run 43,200 miles as of March 1, 1936, and the service rendered by the pistons is said to have been satisfactory.

Your committee expects to keep in touch with future developments in light-weight pistons and will report developments as they occur. We have also accumulated data with regard to the light-weight piston valves and expect to report on that subject next year.

The subcommitte report was signed by: H. H. Lanning (chairman), Geo. McCormick, C. Harter, D. S. Ellis, and A. H. Fetters.

Pins and Bushings for Brake and Spring Rigging

The subcommittee submits the following for Recommended Practice. In preparing this information the locomotive builders and the pin and bushing manufacturers were consulted.

Because of the wide variations in diameters of pins and bushings now in use, it was the conclusion of the committee that stock sizes could be reduced, and it is, therefore, recommended that the following sizes of pins and bushings be adopted as Recommended Practice:

[The table includes bushings with inside diameters from ¾ in. to 1½ in. in steps of ⅛ in., from 1½ in. to 3 in. in steps of ¼ in. and from 3 in. to 4½ in. in steps of ½ in. Bushings having inside diameters up to 2¼ in. have walls 3/16 in. thick, those from 2½ in. to 3 in. have ¼ in. walls and larger sizes have 5/16 in. walls.—EDITOR]

The tubing used for bushings to be accepted with present manufacturers' mill tolerance for diameters, both inside and outside.

All pins are to be finished to not more than 1/32 in. less than nominal diameter.

The material entering into the construction of the pins and bushings to be of a type that can be case-hardened.

The approximate tonnage for pressing in bushings to be on the basis of two tons per inch of outside diameter of bushings. If necessary, the hole to be trued with nominal size straight reamers to suit diameter required.

Pins and bushings to be case-hardened to 1/32 in. minimum depth and to be equivalent to 60 Rockwell C schedule.

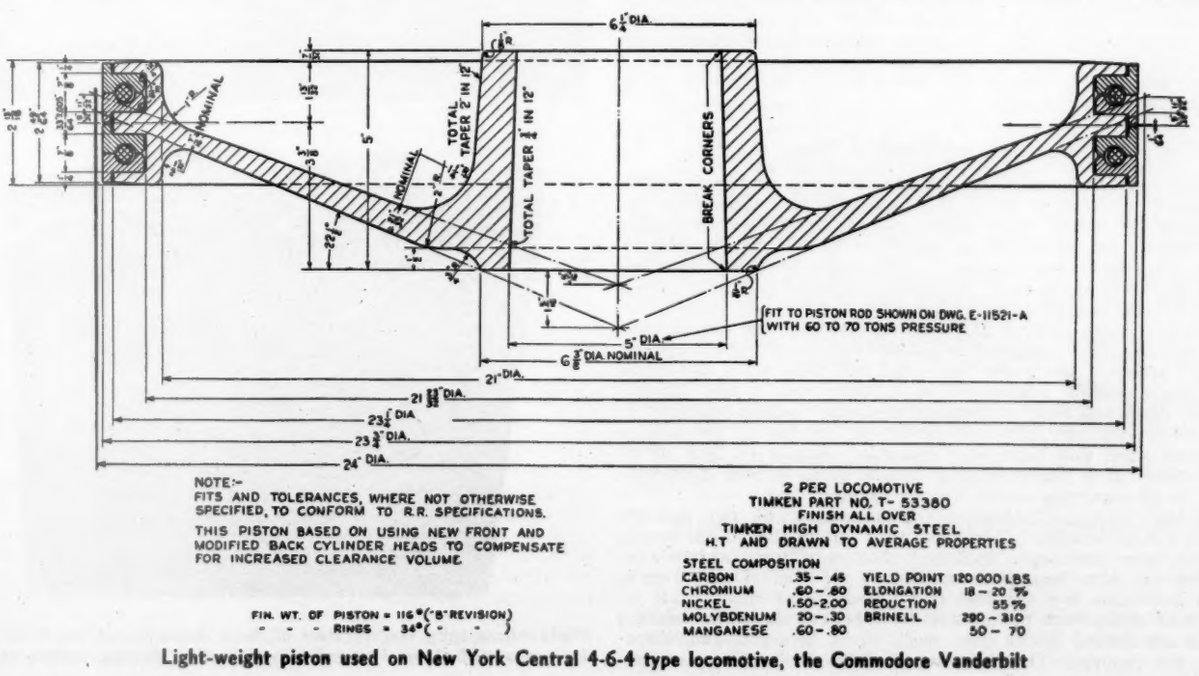
This committee suggests that the subject of material used in pins and bushings be referred to the Committee on Specifications for Materials.

The subcommittee report was signed by: G. H. Emerson (chairman), C. Harter, W. F. Connal, J. E. Ennis, H. P. Allstrand and S. S. Riegel.

Roller Bearings

This report covers steam and electric locomotives for a period, December 1, 1934 to December 1, 1935, but does not include Diesel-electric locomotives or high-speed streamline trains.

Replies to a questionnaire were received from 125 roads, 36 of which reported applications of roller bearings. It is evident



NOTE:-
FITS AND TOLERANCES, WHERE NOT OTHERWISE SPECIFIED, TO CONFORM TO R.R. SPECIFICATIONS.

THIS PISTON BASED ON USING NEW FRONT AND MODIFIED BACK CYLINDER HEADS TO COMPENSATE FOR INCREASED CLEARANCE VOLUME.

FIN. WT. OF PISTON = 116#("B" REVISION)
- - - RINGS = 34#(- -)

2 PER LOCOMOTIVE
TIMKEN PART NO. T-53380
FINISH ALL OVER
TIMKEN HIGH DYNAMIC STEEL
H.T AND DRAWN TO AVERAGE PROPERTIES

STEEL COMPOSITION			
CARBON	.35 – .45	YIELD POINT	120 000 LBS
CHROMIUM	.60 – .80	ELONGATION	18 – 20 %
NICKEL	1.50-2.00	REDUCTION	55 %
MOLYBDENUM	.20 – .30	BRINELL	290 – 310
MANGANESE	.60 – .80		50 – 70

Light-weight piston used on New York Central 4-6-4 type locomotive, the Commodore Vanderbilt

that progress has been made during the past year in extending the use of roller bearings to engine truck, driver, trailer truck and tender truck axles. New applications, including applications which have been authorized but not yet applied, are as follows: 314 engine truck axles and 390 driving axles on electric locomotives and 111 engine truck axles, 70 driving axles, 31 trailer truck axles and 1,104 tender truck axles on steam locomotives. Two engines have been equipped during the year with roller bearings on side rods and main rods and 14 engines had roller bearings applied to various minor valve gear and auxiliary parts. One road has placed orders for 15 4-6-6-4 locomotives which are to be equipped with roller bearings on engine truck, trailer truck and tender axles. Another road has recently ordered 12 4-6-6-4 locomotives, eight of which are to be equipped with roller bearings on engine trucks, drivers, trailer trucks and tender trucks.

Roller bearing failures during the past year were comparatively few and consisted chiefly of worn rollers and cracked and worn races.

Unfortunately, with the introduction of roller bearings, there was not sufficient background of experience regarding the nature and degree of stresses set up in axles by the changed conditions due to substituting roller bearings for plain bearings, consequently considerable trouble has been encountered with broken and failed axles, particularly those of inboard bearing type.

The question of increased speeds also has an important impress on the problem of axle design for roller bearings. Experience gained the last two or three years with axles in high speed streamline train service as well as high-speed electric service has demonstrated that axle stresses increase in a fast ascending ratio for speeds above 70 m.p.h. and that the conventional formula for axle fibre stress cannot be fairly used at these higher speeds.

Whereas freight car axles are designed to carry a maximum of fibre stress, 22,000 lb. per sq. in. and passenger car axles are in general operated at from 80 to 90 per cent of this stress, it is becoming apparent from axle failures at higher speeds that fibre stresses should not be higher than 12,000 lb. per sq. in. for speeds of 100 m.p.h. In addition to this there are certain stresses introduced in roller bearing axles that do not occur when plain bearings are used. On the other hand, roller bearing axles are free from stresses due to overheating that occur with plain bearings.

In steam locomotive service, investigations by various roads have shown that fatigue cracks appear in axles after 300,000 mi. or more of service and for this reason some roads have placed a mileage limit of 250,000 to 300,000 mi. for renewal of roller bearing axles. One road reports that they periodically test axles by magnetic examination. Some roller bearing manufacturers have conducted exhaustive studies into the causes surrounding the fatiguing of axles, with the result that a redesigned axle has been recommended, consisting of an overall increase in diameter and the placing of pressed-fit members, such as the wheels and bearing races, on large diameter of the axle.

Some of the redesigned axles have been applied, but have not had sufficient service to arrive at definite conclusions, however, the subcommittee hopes to have additional information for the next report.

The subcommitte report was signed by: A. H. Fetters, R. G. Bennett, and W. F. Connal.

Driver and Trailer Tires

This committee, with the co-operation of members of the Technical Committee of Tire Manufacturers Association has reviewed the reports from roads covering locomotive and trailer tire failures for the period of December 1, 1934, to December 1, 1935. The data were supplied by 128 roads, of which 59 representing 35,458 locomotives in service, reported 613 tire failures for the year, and 69 representing 2,498 locomotives, reported no failures. Of the failures 212 were attributed to the manufacturing process, 238 to railroad responsibility and 163 not classified.

It is apparent that some roads did not thoroughly investigate and reach definite conclusions as to the cause of tire failures. While there has been an improvement since calling attention to this matter last year, the fact remains 26 per cent of the failures reported since that time were discarded because of lack of information. It is important that this be given greater consideration by all reporting roads for the ensuing year.

Shelled Treads—Tabulation of the causes of tire failures shows a large number of defective tires due to shelled out treads. It has been previously indicated that only tires which were shelled out more than 3/8 in. should be reported. Due to variations in reports and the fact that a number of roads made no report of shelled out tires, leads us to believe that many shelled treads are turned before they reach 3/8 in. in depth, and, therefore, not reported. One road reported 42 trailer tires, another road 47 trailer tires removed from service on account of shelled treads in excess of 3/8 in. in depth. This emphasizes the importance of making a more careful investigation of this type of defect. Your committee has asked the secretary in procuring data for the period June 1, 1936, to December 1, 1936, to request reporting roads to keep, and make report of all tires which have to be removed from locomotives and trued up in a lathe or discarded by reason of shelling. The reporting road will give depth of shelling, whether wheel center was of solid or spoke design, and in the case of trailer tires whether the locomotive was equipped with a booster and/or brakes. This modifies previous instructions relative to a 3/8 in. limit, but the additional information is required to enable us to arrive at a definite conclusion if possible as to the cause of shelled treads and the method which must be followed to minimize this type of failure.

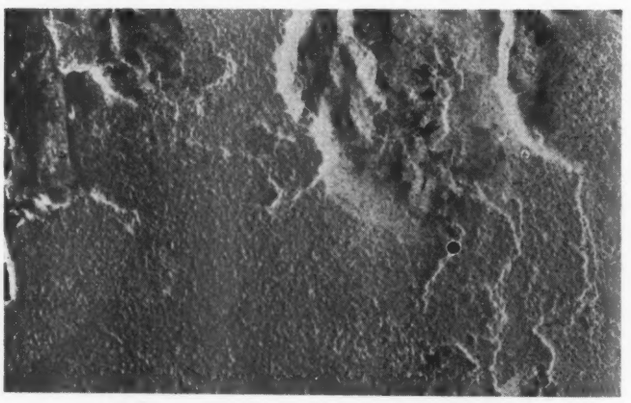
The subject of shelled treads has been discussed with the Technical Committee representing the Tire Manufacturers, particularly as to whether they should be considered under the heading of railroad or manufacturing responsibility. The result thus far has been a memorandum on "The Problem of Shelling in Locomotive Tires and Wheels" submitted by the Tire Manufacturers Technical Committee.

[The memorandum referred to is a lengthy discussion of shelled treads and included with it are illustrations and photomicrographs of treads with this defect. Two of these photomicrographs are included in this abstract.—EDITOR.]

Heat-Treated Tires—The practicability and economy in the use of heat treated tires has also been given consideration. We are advised by the Tire Manufacturers Technical Committee that:

"The application of heat-treated tires is still in a state of development. The earliest applications were made on trailer wheels in an endeavor to minimize shelling where particularly severe service conditions were to be met. The treatment was chosen to give as great an increase in hardness and strength as possible, with ductility as high as or higher than that of the untreated tires. These tires have continued to give satisfactory performance for a number of years in trailer service.

"More recently a number of roads have applied heat-treated locomotive driving tires with physical properties similar to those of trailer tires in the hope of securing greater mileage between



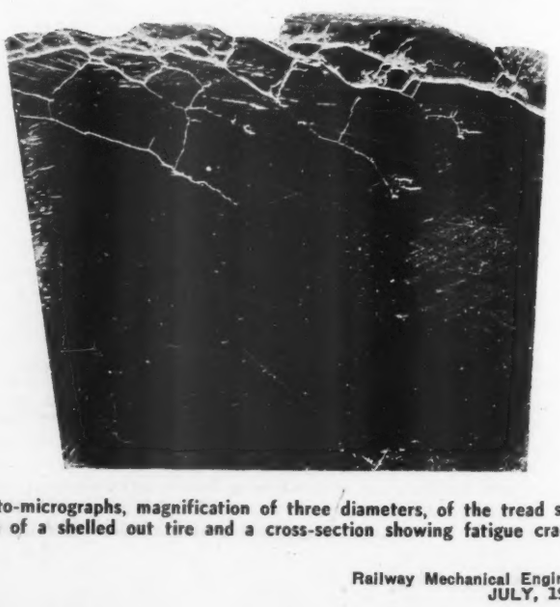
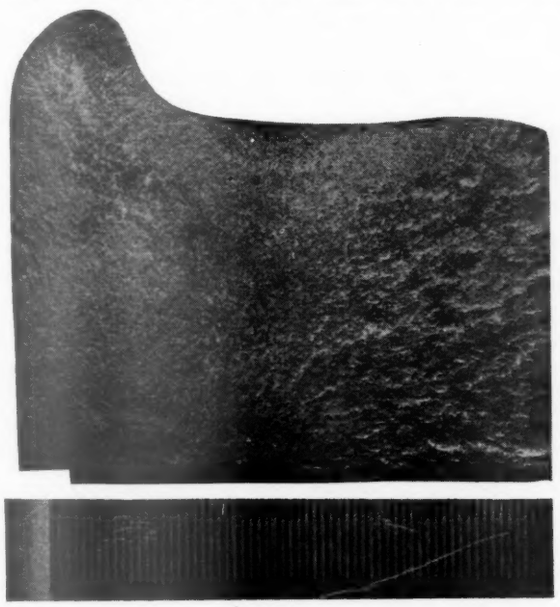


Photo-micrographs, magnification of three diameters, of the tread surface of a shelled out tire and a cross-section showing fatigue cracks

turnings. In many cases satisfactory results have been obtained, but there is considerable evidence to the effect that with heat treatment giving a high degree of hardness it is important that the tire shall be fully and uniformly supported by the rim of the wheel. If the support given to the tire is not uniform because of distortion of the wheel center, improper shimming or other causes, the tire is subject to flexure at the unsupported points. In addition the bore of the tire at these points may be subject to corrosion which greatly reduces the fatigue strength of the tire section. A tire of low elastic limit may distort permanently and adapt itself to the contour of the center, while



Tire failure caused by rough tool marks shown at bottom of illustration

a treated tire of higher elastic limit may be subject to continued flexure leading to failure. A considerable number of the failures of heat treated tires are attributable to this cause.

"As the use of heat treated driving tires is still in progress of development definite specifications cannot be set up. It is the belief that when more information is obtained from service tests definite standards may be possible."

It is therefore essential that those reporting roads who are using heat-treated tires keep this committee informed with regard to the failures they are experiencing, with such additional information as may be helpful in pursuing this subject.

Shop Practices—Your committee is doubtful as to whether mechanical officers, or their responsible subordinates, generally appreciate the large number of tire failures traced to cracks in the bore, developing from rough tool marks, nicks and corrosion, wheel centers out of round, and welding and torch burns. (See accompanying illustration.)

The mechanical officer of one railroad operating over 2,000 locomotives reached the conclusion all the tire failures on his road for the year were due to faulty shop practices. These failures can be much reduced by ordinary care, precaution and proper shop practices.

This committee wishes to acknowledge the co-operation of the tire manufacturers for their assistance. Important data have been gathered thus far and the investigation should be continued. The value of this study will finally depend on the thoroughness of reporting roads in investigating and correctly allocating the causes of their tire failures in future reports.

[Accompanying the report was a comprehensive tabulation of the tire failures reported for the year ended Dec. 1, 1935.—EDITOR.]

The subcommittee report was signed by R. G. Bennett, W. I. Cantley, J. E. Ennis, E. E. Chapman and T. C. Sedwick.

Exhaust-Steam Injectors

Feedwater Heaters—Until this year the subject of feedwater heaters and exhaust-steam injectors has been carried on the docket, but in view of the almost universal application of feedwater heaters to new power and existing modern power, it is the view of the Locomotive Construction Committee that feedwater heaters are no longer experimental devices, and should be dropped from the docket.

Exhaust-Steam Injectors—During 1935 there was little activity in the field of exhaust steam injectors. One road reported six applications and another road reported four applications. One road has recently ordered 15 4-6-6-4 locomotives, five of which are to be equipped with exhaust steam injectors.

Another road reports that the Turbo type injector in use has been giving satisfactory service but they have made no comparative tests to determine economy obtained.

This is submitted as a progress report and it is the intention to continue to investigate these devices.

The subcommittee report was signed by A. H. Fetters and W. I. Cantley.

Oil-Electric Locomotives

Your committee has continued investigations of developments and submits statement showing the number of Diesel-electrics in service in the United States and Canada as compiled from statistics and records of installations of various units. [Table shows 192 locomotives installed since 1925.]

Statement includes 46 oil-electric battery locomotives operated from both internal power generated by Diesel engines as well as external power obtained from trolley or third rail connections but does not include gas-electric nor butane-electric locomotives.

About 85 per cent are 300 to 600 hp. capacity which evidently are considered most favorable for general switching assignments as with the higher ratio of tractive effort per total weight of locomotive obtainable from oil-electrics, it is possible to substitute them for steam locomotives of 800 to 1200 potential horsepower ratings and effect economies in operation by lower fuel rates and savings of wages and enginehouse expense. However, to obtain the greatest savings it is essential that the oil-electric units are operated in service assignments of 16-24 hours per day.

Recent installations show that heavier types of oil-electric locomotives, 900 to 1200 hp. capacity are being used in switching and transfer service and larger units of 1,600 to 2,000 and 3,600 hp. are being introduced into road and helper service, but the initial cost of the larger units will require assignments from which greater locomotive mileage per annum can be obtained than possible with the steam locomotives replaced. Improvements in design and construction are evidenced in the most recent Diesel-electrics which with higher availability assured and increase of locomotive miles per annum attained, economic operations can be anticipated.

We have made no comparisons of operation costs per hour or per locomotive mile for any oil-electrics of any ratings since their work assignments, power factor developed, territorial locations, etc., govern these costs to a considerable extent, and actual costs of operations would not be comparative except under precisely similar conditions.

The average service life of these locomotives or cost of repairs also cannot be consistently estimated or computed from information available and considerably more performance and development information must be available to establish these characteristics.

In addition to this some roads are using types of Diesel-powered trains. Since the Union Pacific streamliner, and the Burlington "Zephyr" streamlined units—both Diesel-driven trains—made their appearances, the "Comet," the "Flying Yankee," "The Rebel," "Royal Blue," "Green Diamond," "City of Portland," and similar trains have come successfully into use and doubtlessly much progress will be made with such Diesel powered trains in the future.

The subcommittee report was signed by S. S. Riegel (chairman), W. F. Connal, and W. I. Cantley.

Pipe Fittings for 300-Lb. Pressure

Your committee has considered the proposal that we include the 45 and 90-deg. street ell fittings with the 300-lb. unions and fittings of the nut and nipple type adopted for recommended practice in 1931.

Railroads canvassed develops the fact that there is a general demand for this type of street ell fitting, although a few roads do not use them.

We, therefore, believe it is consistent to include them in this standard, then adopted, and so recommend, leaving their use optional, and in that connection submit the attached illustrations, dimensions and characteristics of the sizes recommended for the 45 and 90-deg. street ells to be included. [Drawings omitted.]

The subcommittee report was signed by S. S. Riegel (chairman), W. I. Cantley, and J. E. Ennis.

Master Mechanics Front End Arrangement

The subcommittee appointed to consider a revision of the design known as the "Master Mechanics" front end as described in the 1906 proceedings of the American Railway Master Mechanics Association submitted a comprehensive report based on recent standing and roads tests made while redrafting various classes of bituminous coal burning locomotives.

[Due to the importance of the subject, this portion of the report will appear as a separate article in a later issue.—EDITOR.]

The subcommittee report was signed by D. S. Ellis (chairman), and A. H. Fetters.

Standardization of Valves

Upon request, a survey was made as to the attitude of the railroads in connection with the standard A. A. R. 300-lb. globe and angle valves, and the information received indicates that out of 106 roads reporting, 53 stated that they have adopted the valves as standard, 10 propose to adopt, 26 have not adopted nor propose to adopt, and 17 were indefinite. The 63 roads which have adopted or propose to adopt the valves as standard represent 33,022 locomotives out of a total of 48,767 locomotives.

The subcommittee report was signed by J. E. Ennis (chairman), S. S. Riegel, and W. I. Cantley.

The full report was signed by W. I. Cantley (chairman), mechanical engineer, L. V.; H. H. Lanning (vice-chairman), mechanical engineer, A., T. & S. F.; R. G. Bennett, general superintendent motive power, Penna.; G. McCormick, general superintendent motive power, S. Pac.; W. F. Connal, mechanical engineer, Can. Nat.; G. H. Emerson, chief motive power and equipment, B. & O.; A. H. Fetters, general mechanical engineer, U. P.; J. E. Ennis, engineer assistant, N. Y. C.; S. S. Riegel, mechanical engineer, D., L. & W. (deceased); D. S. Ellis, mechanical assistant to vice-president, C. & O.; C. Harter, chief mechanical engineer, Mo. Pac., and H. P. Allstrand, principal assistant superintendent motive power and machinery, C. & N. W.

Discussion

Mr. Cantley introduced the chairmen or other members of the subcommittees, who made the presentations of the various parts of the report. With respect to driving wheel centers with thin walls, the question was asked whether difficulty had been experienced with higher hub temperatures with the new wheels. Representatives of the Missouri Pacific, the New York Central and the Chesapeake & Ohio reported no trouble from this source. The Chicago & Eastern Illinois reported six failures of the early design of this type of wheel center. The redesigned wheels with which the failed wheels had been replaced had given no trouble after two years in service.

The section of the report on roller bearings drew forth considerable discussion in answer to a request from the floor for descriptions of the axle troubles which had been experienced on locomotives equipped with roller bearings. The difficulties on several roads for which representatives spoke all arose within the portion of the axles covered by the bearing and were diagnosed as starting from detail checks or fractures in the surface of the axles adjoining the edges of the inner bearing races which are shrunken on. More trouble is experienced with inboard bearings than with those on the outside of the wheel. W. H. Flynn (N.Y.C.), who reported trouble of this kind, said that it had been overcome by new designs, and expressed great confidence in the bearings. D. S. Ellis (C. & O.), reported that on inspection of engine truck axles fitted with roller bearings at the time of each Class 3 repair it was found necessary to remove all axles from this cause.

A. H. Fetters (U. P.) called attention to the effect on the stresses on the axle of the shrinking on of races and spacer rings; an effect which might produce stresses at the surface of the axle in excess of its elastic limit. He said it had been suggested that rolling of axle surfaces at these ring seats might improve conditions by increasing the strength of the material. H. W. Faus (N. Y. C.) doubted the value of the cold rolling process because the resulting sacrifice of ductility of the surface metal tends to reduce its fatigue strength and make it more susceptible to the effect of any slight surface scratches which might be present. The only information, he said, on which to judge the effect of the cold rolling process is that obtained from endurance tests with small, highly polished specimens, results of which admittently would be severely affected by the slightest surface defect and in which ductility is of less importance than in the case of axles.

Another subject which drew forth more than ordinary comment was that of driver and trailer tires. The committee stressed the handicap it suffered from the lack of adequate information in the reports of shelled treads which railroads are sending to the committee. D. J. Sheehan (C. & E. I.) related a number of the peculiar circumstances which have been noted in connection with shelled-out trailer tires on that road, many failures from which cause were experienced during the past winter. About 85 per cent of all of the failures, he said, occurred on one class of Mikado type locomotives in fast freight service. Of the failures on this class of power 93 per cent occurred on the left side of the locomotive. He said that he had found others were experiencing the same peculiarity. The only condition he could find which would seem to have any relation to this peculiarity was the fact that on a double-track railroad the inside track rail, on which the left-hand wheels run, is less flexible than the outside rail.

Lawford Fry (Edgewater Steel Company) expressed the opinion that the increase in tread failures is due to increases in speed and load. On one road for which he had the data he said that the number of shelled tread failures in 1935 was twice as great as in 1934. That this was not the result of changes in reporting was indicated by the fact that failures caused by shattered rims, a defect for which the manufacturer is clearly responsible, were the same in both years. The facts available indicate that the failures probably averaged about one-half per cent of the wheels in service per year. He also presented data indicating that the failures from tread shelling on tenders were much greater on the leading axles of each truck and much greater on the front truck than on the rear truck. He pointed out that the solution does not lie with the metallurgist alone but must include a study of the mechanical design of the equipment.

J. W. Burnett (U. P.) said that locomotive tire failure studied on the Union Pacific occurred in tires which had received their last turning. The practice on that railroad, he said, is to fit tires to individual wheel centers and not to permit the use of shims. To this he attributes their present lack of failure. He expressed the opinion that the major responsibility of developing a steel wheel suitable for all around service rests upon the manufacturers. C. Cromwell (B. & O.) said that his railroad had experienced practically no trouble from tire failures. He mentioned a few failures of trailer tires through the bolt holes where they were bolted to the rim of the wheel. This road, he said, turns up the wheel centers when new tires are required and fits the tires to the center.

In connection with Exhibit H, covering the revised master mechanics locomotive front and arrangement, L. Richardson, (B. & M.) mentioned some excellent results being secured with annular ported nozzles on that road. Mr. Fetters stated that in general the drafting ratios proposed in the report will result in good steaming locomotives. He said that all types of stack and nozzle combinations have been tested on the Union Pacific, the best results being secured with the multiple-ported nozzle with which a vacuum of about one inch is secured per pound of back pressure.

Action.—The report was accepted and the recommendations referred to letter ballot.

Tank Cars

During the year the committee considered a total of 328 dockets and applications for approval of designs, of which 186 covered shipping containers for application to new cars or for replacement on existing cars. Nine applications covered 28 multi-unit cars to be used for the transportation of 15 Class I. C. C.-106-A-500 one-ton containers each. One application covered a new underframe and trucks for use in mounting an existing tank-car tank. A total of 112 applications covered alterations in existing equipment. Twenty applications were received for approval of tank car appurtenances.

Applications	Tank Car Appurtenances
2	Angle valves, 2 in., for I. C. C.-105-A series tank car tanks.
1	Angle valve, 1 in., for I. C. C.-105-A series tank car tanks.
1	Frangible disk safety device, with ignition element, for I. C. C.-107-A containers.
1	Manhole cover, modification in design.
2	Manway reinforcement, Class I. C. C. 105-A series, fusion welded tank car tanks.
1	Outlet chamber arrangement, adaptable for different ladings.
1	Outlet valve, spring type, for tanks transporting a fertilizer compound in solution.
1	Outlet valve, for replacement, on existing tank car tanks.
1	Outlet valve rod stuffing box.
1	Outlet valve, positive type.
1	Safety valve, 5 in. with resilient gasket, modification in design.
1	Safety valve for I. C. C.-105-A series tanks in tetraethyl lead service.
2	Shipping containers, Class I. C. C.-106-A-500, proposed design.
1	Steam heater coil arrangement.
1	Tank stabilizer, to replace tank bands.
1	Unloading arrangement for tank car tanks used in ammonia water service.
1	Valve arrangement for Class I. C. C.-106-A-500 shipping containers.

Fusion Welded Tanks

Following a hearing before the Interstate Commerce Commission, held September 5 to 7, 1934, the commission, under date of November 13, 1935, denied the petition of the association for approval of fabrication by the fusion-welding process of tank-car tanks to be used in the transportation of all dangerous commodities, except chlorine. The commission likewise denied peti-

tions of E. I. du Pont de Nemours and Company and the Union Tank Car Company for approval for experimental service of tank-car tanks fabricated by the fusion-welding process. The commission did, however, approve the petition of Grasselli Chemical Company for approval for experimental service of 10 fusion-welded, rubber-lined tanks for the transportation of muriatic acid for the reasons that muriatic acid will subject these tanks to low internal pressure; difficulties due to moisture remaining in tanks after hydrostatic test pressures, and the difficulties experienced in applying rubber lining over rivet heads and the edges of lap seams in tanks constructed with riveted and calked seams will not be present in the smooth interior of tanks fabricated by means of the fusion-welding process.

By petition, dated December 19, 1935, the Union Tank Car Company asked for a reconsideration of its petition and requested the right to use in experimental service in the transportation of liquefied petroleum gas 25 cars to be equipped with tanks fabricated by means of electric fusion-welding, but otherwise conforming to Shipping Container Specification I. C. C. 105-A-400.

The commission, under date of April 15, 1936, upon further consideration of the record and in the light of the added facts disclosed in the petition of the Union Tank Car Company for reconsideration, authorized further service tests of petroleum products in the 10 cars already built and authorized the construction of 15 additional cars to be constructed in all respects similar to the 10 cars already constructed.

The commission, in its order of April 15, 1936, also authorized the construction for experimental service of one tank-car tank of nitric-acid-resistant metal by the fusion-welding process for the E. I. du Pont de Nemours & Company and 25 tank-car tanks for experimental service in the transportation of petroleum products for the Phillips Petroleum Company; the tanks to be constructed in accordance with I. C. C. Specification 105-A-300 except that fusion-welding may be substituted for the method of construction covered by that specification.

In granting the authority to construct and operate the foregoing fusion-welded tank-car tanks in experimental service, the commission requires certain inspections and reports to be made by the owners or operators of these cars.

The Chlorine Institute, Inc., has submitted an improved safety valve for use on cars transporting chlorine. This valve has been developed in accordance with results of tests conducted in co-operation with your committee. The committee has authorized The Chlorine Institute, Inc., to manufacture and place in service 50 valves of this improved design.

Classification of Tank Cars

The matter of re-classification where a new tank is applied to an existing underframe has arisen during the year due to the large number of tanks of I. C. C. classification which have been built for application to existing underframes and trucks. For transportation and service requirements, tank cars shall always bear the classification of the tank or tanks mounted thereon. In other words, if a new Class I. C. C. 103 tank-car tank is mounted on an existing underframe which previously carried an A. R. A. III tank, the car shall be re-classified as I. C. C. 103.

In connection with this application of a new tank to existing underframe, the requirements of Par. (15), Section (t), Interchange Rule 3, should be met. This rule provides that, in the application of new tanks to secondhand underframe and trucks, the underframe must at least conform to the A. R. A. Specification for Class III tank cars, effective May 1, 1917 to July 1, 1927, and the trucks must be equipped with cast steel sideframes meeting A. A. R. specifications.

The committee has received applications during the year for the approval of welded splash angles on the outside of acid tanks. The committee is definitely opposed to autogenous welding on tank-car tanks when it is not possible to properly anneal the tank as a whole after such welding has been performed. The committee will, therefore, not approve any further requests for the use of welded splash angles on riveted tank-car tanks.

As result of continued unfavorable conditions, your committee has recommended to the Arbitration Committee the extension to January 1, 1938, of the following requirements of Interchange Rule 3: Section (t), Par. (8)—Head-block anchorage on tank cars; Section (t), Par. (9)—Wood shims between longitudinal anchorage and underframe, on tank cars; Section (t), Par. (14)—Dome covers secured by hinge or chain, on tank cars; Section (t), Par. (16)—Class I tank cars prohibited in interchange.

Protection of Air Vents, Venting and Loading Pipes

The committee has received a number of applications for the alteration of cars, both of A. R. A. Class III and I. C. C. Class 103 designs, involving the application of air vents, venting and loading pipes, etc., on the dome without being properly protected by being set into a securely covered recess or by means of a cast, pressed-steel, or malleable-iron housing with a cover that can be securely closed.

It is the opinion of the committee that, when changes are made in cars of former A. R. A. classification, they should be made to conform as far as practicable to the specifications in effect for cars of corresponding I. C. C. classification even though the commodities to be transported are of a non-regulatory character.

In accordance with this opinion, on future applications for cars equipped with air vents, venting and loading pipes, etc., on the dome, proper housing or protection cover will be required in accordance with paragraph I. C. C.-11 of Specification 103.

It is the unanimous opinion of the committee that the welding of placard holders by either tack welding or edge welding to the shells of tank-car tanks should be prohibited in the future but that this action should not be retroactive as to any cars now in service covered by previous approval of this practice. Accordingly, the committee will no longer approve this method of applying placard holders to tank cars.

It is the further opinion and recommendation of the committee that, when placard holders which have been previously welded to tank-car shells become loose, they should not be reapplied in this manner but that the regular placard board should be applied as covered by the standard tank-car specifications.

Suggested Changes in Specifications

The committee has recommended to the Bureau of Service, Interstate Commerce Commission, and to the Bureau of Explosives that a sentence be added to paragraph 6 (a) of Specification I. C. C.-103, making this paragraph to read as follows: "I. C. C.-6. Riveting.—(a) For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 in. All rivets must be driven hot. *The use of two 'liners' not to exceed 1 in. in width and 1/16 in. in thickness, placed at an angle across the longitudinal seams between two rows of rivets near the internal tank heads on compartment cars to prevent the liquid from passing along the longitudinal seams from one compartment to another while cars are being water tested, will be permissible.*"

Upon recommendation from the Committee on Tank Cars in its report for 1933, the Association adopted as recommended practice, by letter ballot, designs of dome covers for tank cars of Classes I. C. C. 104-A and I. C. C. 105-A as covered by Figs. 7 and 8 now incorporated in Supplement No. 2 to the current tank-car specifications, issued in April, 1936.

[The committee here included eight recommendations regarding detailed changes in Fig. 8, to be submitted to letter ballot. —Editor]

As a result of continued reports of failure of hollow cast-iron plugs in the heads of tank cars, it is recommended that the following new paragraph, to be designated "A. R. A.-16," be included in I. C. C. Specification 103: "*A. R. A.-16. Solid plugs when inserted from the outside must be so indicated by having a raised 'S' cast integral on the face or top of the square head or be otherwise marked 'S' by steel stamp, prick punch or legible stencil, indicating the plug is solid. Plugs inserted from the inside are identified by appearance of the plug on the outside of the tank whether hollow or solid—therefore, no mark or stencil required.*"

It is recommended that the foregoing addition to these specifications be submitted to letter ballot of the members for adoption.

Interior Heater Pipes

During the past year applications have been received from builders and owners of tank cars requesting approval of electric-resistance welded pipe for interior steam lines in tank cars. As a result of the study which has been given this subject by the committee, it is recommended that Par. 1 under Sec. G—Specifications for Tank Car Heater Pipes, page 7 of the Tank Car Specifications, be changed in accordance with the proposed form shown below: *Proposed Form:* 1. Heater Pipes and Fittings.—When threaded joints are used, pipes shall be not less than two-inch "extra *strong*" lap welded *steel or wrought iron to current A. A. R. specifications;* or *electric-resistance-welded steel of same diameter and thickness to current A. S. T. M. specifications. When the joints are welded, instead of threaded, to give them substantially the same bending strength as the body of the pipes, the thickness may be reduced 20 per cent.* Joints shall be made by threaded wrought couplings, forged unions, or welding. A minimum number of connections shall be used.

The committee recommends the submission to letter ballot for adoption as recommended practice the specifications for fusion-welded aluminum tank-car tanks for the transportation of non-dangerous commodities as shown in the attached Exhibit A. These specifications have been prepared in co-operation with

representatives of the car builders and the Aluminum Company of America.

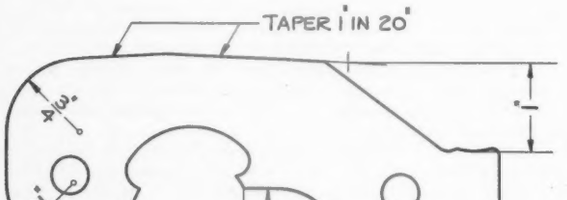
The report was signed by Chairman G. S. Goodwin, assistant to general superintendent motive power, Chicago, Rock Island & Pacific; Vice Chairman F. A. Isaacson, engineer car construction, Atchison, Topeka & Santa Fe; A. G. Trumbull, chief mechanical engineer, Chesapeake & Ohio; G. McCormick, general superintendent motive power, Southern Pacific; W. C. Lindner, chief car inspector, Pennsylvania; A. E. Smith, vice-president, Union Tank Car Company; G. E. Tiley, assistant traffic manager, General Chemical Company; C. C. Meadows, master car builder, Tidewater Oil Company; G. A. Young, head, School of Mechanical Engineering, Purdue University; F. Zeleny, engineer of tests, Chicago, Burlington & Quincy; W. C. Steffa, transportation manager, Sinclair Refining Company; R. T. Baldwin, secretary, The Chlorine Institute, Inc.

Action.—The report was accepted and the recommendations referred to letter ballot. The committee was accorded a vote of thanks for its very complete report.

Wheels

The report includes in Appendix A, a specification for two-wear wrought-steel wheels, having a rim section which conforms substantially to the design of the multiple-wear wheel. This permits measuring service metal with the present standard steel-wheel gage. The tread and flange contour of the two-wear wheel corresponds, therefore, to that of the multiple-wear wheel, and in preparing the drawings, consideration was given to revising the tread and flange contour of the multiple-wear wheel with respect to dimensioning.

Accompanying the report are various revised wrought-steel wheel designs as they appear in the Wheel and Axle Manual and also in the Manual of Standard and Recommended Practice. The report calls attention to the continuance of shelled treads as a cause for the premature removal of wrought-steel wheels from service and says that the best results so far obtained in overcoming this difficulty have been by improved methods of heat treatment.



Minimum flange thickness, height and throat-radius gage for new cast-iron, one-wear wrought-steel and cast-steel wheels

Outstanding changes in the specifications for cast-iron car wheels, shown in Appendix *B* of the report, are designed to provide improved service properties by changes in such details as rim thickness, heat treatment, flange thickness, tape size, and tread and flange contour. The major change in the rim thickness is an increase from 1⅝ in. to 1⅞ in. for 650-, 700- and 750-lb. wheels, and from 1⅞ in. to 2 in. for the 850-lb. wheel. In heat treatment, increased pitting temperatures and controlled cooling of the wheels provide improved physical properties and make possible a more rigid thermal test by increasing the time limit.

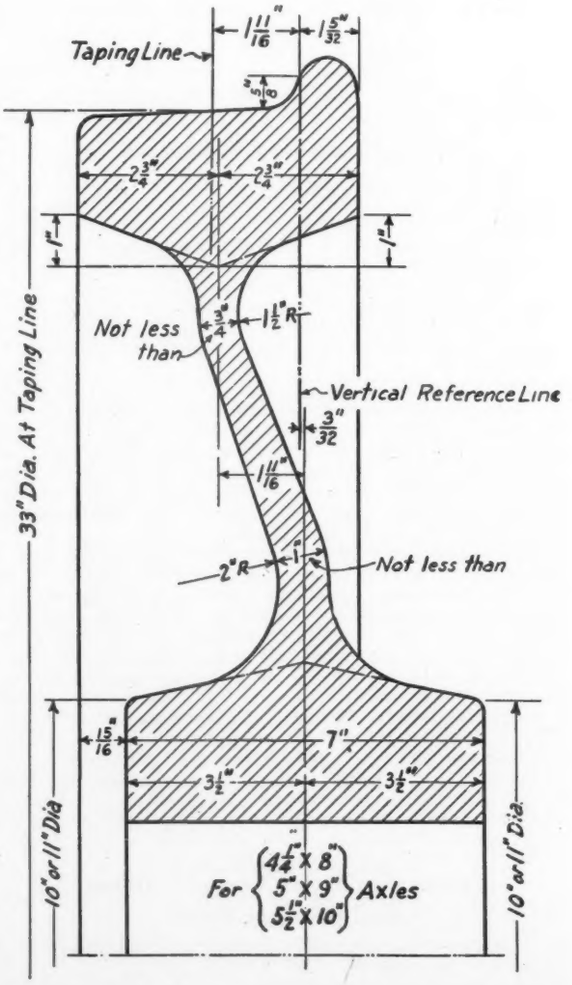
The maximum flange thickness has been reduced 1/32 in. to conform with that of the one-wear wrought steel wheel. A revised method of indicating the tape sizes of new wheels is recommended in order to permit matching wheels to half tape sizes in mounting. A change in dimensions of the tread and flange contour of the chilled-iron wheel is provided to conform with the practice recommended for the wrought-steel wheels.

The report recommends the addition of a paragraph to interchange Rule 71 (owner's responsibility) to condemn flat spots 2½ in. long or over, or two or more adjoining flat spots each of 2 in. in length or over. Certain changes are also recommended to clarify a misinterpretation of freight-car Rule 75 and passenger car Rule 7 (f). The report states that extensive observation of the use of the worn-through-chill condemning gage indicates that it is not fulfilling the requirements, as numerous instances have been observed in which wheels with flattened surfaces condemnable by the gage, are not actually worn through the chill. The report, therefore, recommends certain revisions in Rule 73 and the addition of a new rule 73-A to cover an out-of-round condition. A corresponding revision in the Wheel and Axle Manual is recommended. In Rule 76 covering tread-worn-hollow wheels, it is recommended that the first part of the rule be limited in application to cast-iron wheels and the latter part made to include both wrought- and cast-steel wheels. Also Rule 81 is suggested for revision to include one-wear wrought-steel wheels. Corresponding changes in the Wheel and Axle Manual are recommended.

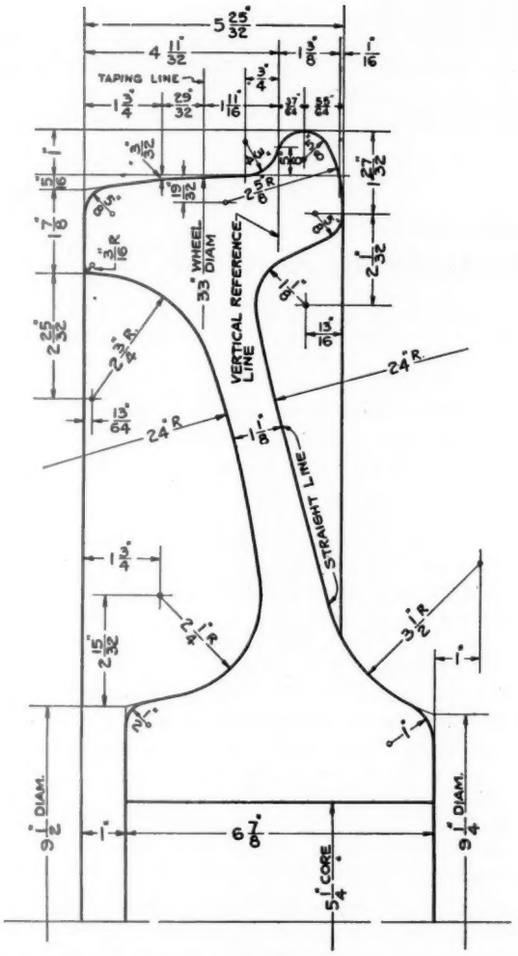
In view of the damaging influence to lading, track and equipment resulting from flat spots on wheel treads at present high speeds the report recommends that consideration be given during the coming year to reducing the condemning limits for slid-flat spots from 2½ to 1½ in. Before making such a drastic change, however, substantial data must be secured to show what the effects will be upon the movement of cars in transit and the removal of wheels for this defect.

The report states that the master gage for use in connection with wheels and axles is practically obsolete and that it will apparently be necessary to develop go-and-no-go gages conforming to construction tolerances for practically each type of standard gage now in use. The report recommends that the I.C.C. Bureau of Locomotive Inspection be requested, through the proper channels, to revise its Rule 145 to conform with the present A.A.R. Rule and permit the same wear limits for cast-steel wheels in locomotive tender service as have been recognized and demonstrated to be perfectly safe for operation in car service.

In closing, the report expresses appreciation for the cooperation received by the committee during the past year from the Manufacturers of Wrought Steel, Cast Steel, and Cast Iron Wheels. Joint conferences held with these manufacturers' representatives have helped advance the mutual interests of the


Taping Line
Not less than
Vertical Reference Line
Not less than
33" Dia. At Taping Line
10" or 11" Dia
10" or 11" Dia
For 4¼" X 8" 5" X 9" 5½" X 10" Axles

Thirty-three-inch two-wear wrought-steel wheel adopted 1936



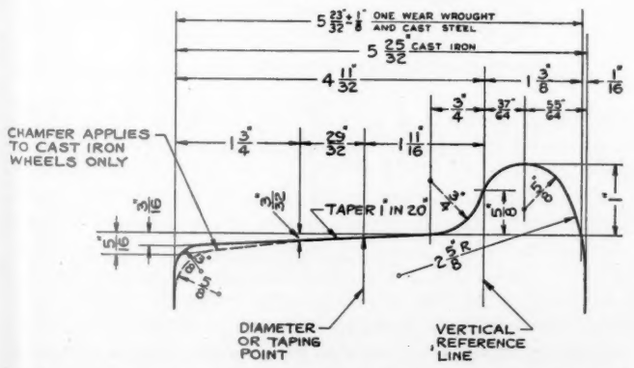
Thirty-three-inch 650-lb. cast-iron wheel for cars of maximum gross weight not to exceed 103,000 lb.

manufacturers and the users of the different types of wheels.

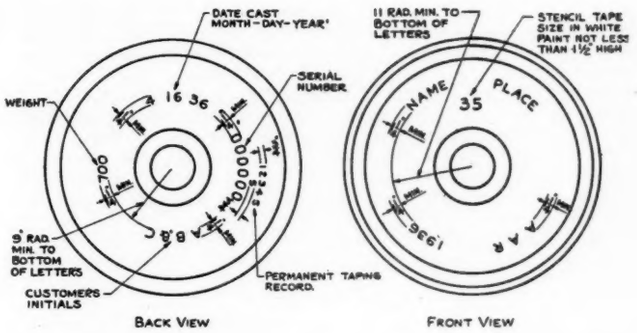
The report was signed by Chairman R. G. Henley, superintendent motive power, Norfolk & Western; Vice-Chairman F. W. Hankins, chief of motive power, Pennsylvania; C. J. Bodemer, superintendent machinery, Louisville & Nashville; F. H. Hardin, assistant to president, New York Central; J. Purcell, assistant to vice-president, Atchison, Topeka & Santa Fe; and J. J. Tatum, general superintendent car department, Baltimore & Ohio.

Discussion

J. E. Mehan (Chicago, Milwaukee, St. Paul & Pacific) raised a question regarding the necessity of restricting ground wheels to system cars as recommended in the report. Mr. Coddington replied that the privilege of grinding car wheels had been greatly abused; that portable grinders were still being used in certain instances. The committee feels that the restriction is necessary. J. McMullen (Erie) said that if wheels wear out

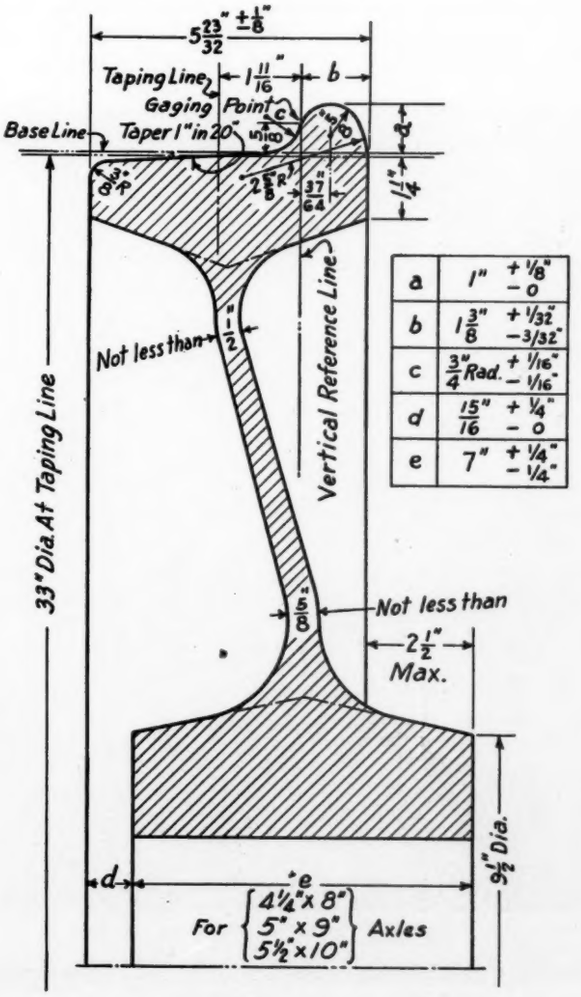

ONE WEAR WROUGHT AND CAST STEEL
CAST IRON
CHAMFER APPLIES TO CAST IRON WHEELS ONLY
TAPER 1" IN 20"
DIAMETER OR TAPING POINT
VERTICAL REFERENCE LINE

Tread and flange for cast-iron, one-wear wrought and cast-steel wheels adopted 1936



When taping the wheel, numerals will be chipped off as follows: Tape 1, chip no. 1 numeral; tape 1.5, chip no. 1 numeral and the underneath no. 5 numeral; tape 2, chip no. 2 numeral; tape 2.5, chip no. 2 numeral and the underneath no. 5 numeral, etc.

of round, it must be on account of a defective chill and that therefore he doubts the advisability of attempting to reclaim such wheels by grinding. J. W. Burnett (Union Pacific) asked if the committee is investigating the subject of cylindrical versus taper tread wheels, and was informed that wheels of the cylindrical tread type are now under observation but the committee has nothing to report at the present time. H. W. Faus, engineer of tests (New York Central) said that this subject pops up once in every generation and that an examination of the record shows that cylindrical tread wheels have been tried in the past many times and discarded. To make sure that it is not overlooking a bet, Mr. Faus stated that the New York Central has recently made tests of two standard coaches with four-wheel



One-wear wrought and cast-steel wheel adopted 1934 —Revised 1936

trucks, one equipped with cylindrical tread wheels in comparative service, and definitely shown that for this type of equipment at least the cylindrical tread wheels are detrimental rather than beneficial. R. L. Kleine (Pennsylvania) stated that his road has 20 multiple-unit cars equipped with cylindrical tread wheels in test service and expects to obtain some definite information regarding comparative performance within a short time. Lawford Fry (Edgewater Steel Company) said that equipment design and roadbed conditions both have a bearing on the question of what type of tread should be used and that experience has shown certain advantages for cylindrical tread wheels on relatively light multiple-unit equipment.

Action.—The report was accepted and referred to letter ballot.

Lock-Tite Mohair Velvet Upholstery Fabrics

A line of mohair velvet upholstery fabrics for use in railway coaches and other transportation equipment has been developed by the Collins & Aikman Corporation, New York. These fabrics possess unusual qualities because of the special type of construction employed. The mohair pile is locked in the foundation fabric by impregnating the latter with a Latex compound. This makes it possible to increase materially the density of the pile and seals the fabric against the penetration of dust. The dense pile can be cut low and stands straight out so that there is no change of sheen with a change in the direction of the source of light on the surface.

A large range of patterns and color combinations comprise this line of fabrics. The designs range from the classic chevron to shaded checks and wavy plaids. A number of florals are also available. A variety of pattern and color combinations are achieved by the use of plain dye base colors by which the patterns are printed in suitable color combinations. Patterns in woven colors are also available.

Chevron motif in three shades of the color selected—The velvet photographed is peacock blue

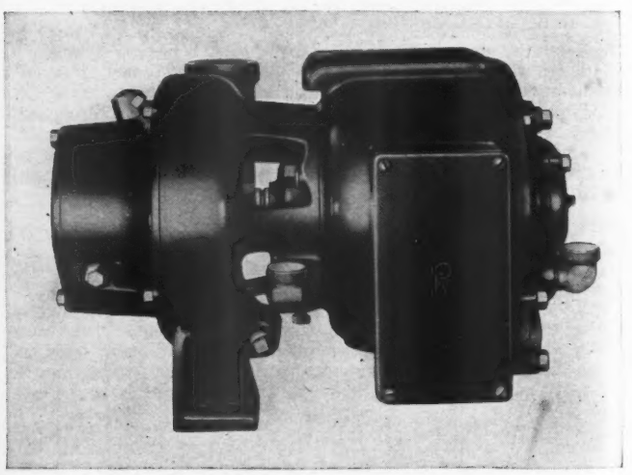
Improved Headlight Generator

A development in headlighting equipment recently announced by the Pyle-National Company, Chicago, is designed to meet the more exacting requirements of modern high-speed train operation. This equipment employs a new principle of alternating current generator construction and the use of a low-voltage headlight lamp with a concentrated filament that is said to produce fully three times the headlight beam intensity obtained from present type headlight bulbs. The a.c. turbo-generator provides the low voltage for the headlight and standard 32-volt current for the cab and auxiliary lights.

The turbine is a standard Pyle-National type provided with stainless steel valve and cage, drop-forged turbine wheel with nickel-alloy blading and a sensitive positive governor control. The rotating element is provided with ball bearings of liberal size, lubricated by the Pyle-National system of controlled circulation.

The omission of armature windings, commutator, collector rings and brushes in the alternating-current generator reduces maintenance and inspection to a minimum. The regulation is said to be equal to that of compound direct current machines.

The installation of this equipment involves only slight changes in present headlight cases. When the low-voltage lamp is used the energy is supplied by the machine through a transformer located in the headlight case.



Pyle-National alternating current turbo-generator

The lamp stand is a permanently-adjusted type which eliminates focusing uncertainties when lamp replacements are made.

The alternating current turbo-generator can be used with present 32-volt headlights without change. However, when low voltage headlighting is required, a transformer is installed at the case, the lamp mounting device is exchanged and the opening in the reflector made larger to accommodate a prefocused socket.

The machines are available in a range of sizes, to meet all locomotive headlighting conditions and are adaptable to train control service.

EDITORIALS

High Lights of the Convention

The meeting of the Mechanical Division of the Association of American Railroads, held in Chicago, June 25 and 26, which was preceded by a meeting of the General Committee, was well attended. Each of the standing committees of the Division has been in existence for many years, has well-defined objectives, and there is little change in the committee personnel from year to year. As a result, the reports deal largely with details relating to improvements in the present standards and recommended practices. Positive recommendations are made only when the facts clearly indicate the wisdom of the action to be taken. Where new or radical elements are interjected because of changing conditions or the introduction of new materials and designs, such facts as are available are reported upon, but action is not recommended until sufficient data have been assembled upon which to base sound judgment. As a result, there is not as much opportunity for heated discussions as was true in the earlier days of the association, when the standards and recommended practices had not reached so advanced a stage.

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There are few opportunities for dramatic presentation and at only one time during the two days of the meeting did the discussion approach the dramatic. The Committee on Car Construction, with the co-operation of the Design Committee of the American Railway Car Institute, has made an excellent job, at the expenditure of considerable time and money, in designing A.A.R. box, auto box and hopper cars. Unfortunately the railroads as a whole have not taken advantage of these standard designs to as great an extent as had been hoped for.

The design for the box car was submitted in 1932 and yet in 1934 only about one-third of the cars ordered followed the A.A.R. standards completely, or even extensively. An even smaller percentage of A.A.R. box cars were among those ordered in 1935. Chairman Kiefer of the committee, in presenting the report, frankly challenged the Division and said that unless the members of the A.A.R. intended to follow these standards, it would be futile to attempt to establish other standards. Members of the committee have heavy responsibilities on their individual railroads and cannot afford to give the time to the development of standard cars, unless the railroads seriously intend to follow these standards.

Representatives of a number of railroads spoke highly of the work of the committee, urged that its program be continued, and indicated that they were using the standard designs. Representatives of roads not following the standards discreetly kept in the background and no explanation was given for the lack of support for the A.A.R. designs. Apparently, however, the response to the committee's challenge, and the action taken, were such as to encourage the committee to continue work on its program.

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At the afternoon session on Thursday, Chairman Garber read a statement from the General Committee, urging that the younger members of the Association take a more active part in the discussions. Vacancies occur on the standing committees of the association and, said this statement, "it is difficult for the chairman of the General Committee to select men for these responsibilities unless he knows their ability to handle the job satisfactorily. There is no way for him to find out who is qualified unless they get up and discuss the subjects that are brought before the association."

A glance over the audience, however, indicated that few, if any, of the young men were in attendance. Two of the younger men in the audience did take part in the discussion, but they have done so at previous conventions and undoubtedly intended to do so at this one. Both of these young men, however, are in their late thirties, one of them being born March 14, 1899, and the other January 25, 1897.

Let us hope that as business conditions improve the railroads will find it possible to send the young men in their organizations to these annual meetings. They are a great training school and there is little question but what the investment in sending them to such meetings will pay many times over, if the young men are properly selected and coached.

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A feature of the first session of the meeting was the so-called "pep talks", entirely aside from the regular program of the convention. The speakers included Assistant Chief Shirley of the Bureau of Locomotive Inspection of the Interstate Commerce Commission; L. W. Wallace, director of the Equipment Research Division, A.A.R.; and Roy V. Wright, editor of the *Railway Mechanical Engineer*. These talks, all of an intimate, extemporaneous character, generally touched upon subjects of deep interest to the mechanical department officers, but not necessarily related to matters of standards and recommended practices. Mr. Wallace made clear the objectives of the department of which he is the head and indicated how it could work with and be helpful to the Mechanical Division committees.

One of the speakers also placed emphasis on the importance of the human problem, in that special efforts must now be put forth to train skilled workers and to

develop men for supervisory and executive positions in the mechanical department.

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Samuel Lynn, chairman of the Committee on Loading Rules, indicated when the very complete report of that committee was made a year ago, that there would be little if anything to suggest in this year's report. As a matter of fact, the printed report contains 67 pages, the larger part of it, however, being used for tabular material in connection with the spacing of bearing-pieces on flat cars. Mr. Lynn did indicate, however, that special efforts were being made to modify the rules as much as possible, in order to cut down the costs to the shippers. Safety is the chief requirement and must never be lost sight of. On the other hand, where the requirements are in any way excessive, unnecessary expense is placed upon the shipper, which may make it advisable for him to consider the use of other forms of transportation. The committee has had splendid co-operation from the shippers in making studies and experiments with a view to modifying the rules toward this end.

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One cannot but be impressed by the extent to which organizations or groups of railway supply manufacturers co-operate with the committees of the Mechanical Division in the preparation of their reports. Several times during the discussions of the reports announcement was made that the representatives of different supply interests would have the right of the floor during the discussion of a report in which they were specially interested. This was not taken advantage of in very many instances because the technical experts in these various groups had little to add to the information and data which had been furnished to the committees. It was quite obvious, however, that where they did take part they were listened to with keen attention and their co-operation was highly appreciated. The technical experts of the railway supply companies are in possession of information and have had experiences which make their findings invaluable to the association.

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While the matter did not come before the convention as a whole, there is little question but what, if business continues to improve, a more elaborate convention program will be scheduled for next year, including an exhibit by the Railway Supply Manufacturers' Association. President Sidney G. Down of that organization spoke briefly at a luncheon which the Executive Committee of the R.S.M.A. gave to the General Committee of the Mechanical Division on Wednesday, the day before the convention. He indicated that the expense of such an exhibit was, of course, a large item. On the other hand, it does make it possible for the railway supply companies, at a minimum expense, to demonstrate their equipment and new devices to the mechanical department representatives.

The railway supply companies, hampered by the same lack of business as the railroads, have not had the opportunity that they formerly enjoyed of bringing their devices to the attention of the railway officers. An exhibit with a large attendance at a convention would enable them to do this and at the same time would be a liberal education to the supervisors and officers who have been appointed in recent years and to the more ambitious younger men who will advance to positions of authority.

The railway supply men, in talking among themselves, feel that they can make the exhibit almost a small university from an educational standpoint for those who wish to take advantage of it, and plans will undoubtedly be made toward that end, if business conditions next year are favorable. The new materials which have been developed in recent years promise to revolutionize designs in many respects. Higher speeds and highly competitive conditions in the railroad field make it necessary for the railroads to take advantage of every possible opportunity to reduce the weight of the equipment and make it more efficient and economical in operation.

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The spirit of the convention was saddened by the fact that W. G. Black, vice-president in charge of the mechanical department of the Van Sweringen Lines, who was to have been elected chairman of the Division, passed away on the Saturday prior to the meeting. His death came as a distinct shock to the members, who regarded him highly because of his ability and his constructive efforts in the interests of the Division. Parts of the report of the Committee on Locomotive Construction were prepared by S. S. Reigel, former mechanical engineer of the Delaware, Lackawanna & Western, who also passed away recently.

Locomotive Failures

Failures of either cars or locomotives in service are not only expensive—sometimes extremely so—but delays or damage to persons or goods cause much irritation and criticism. Good will on the part of the public toward the railroad is an asset which must be assiduously cultivated and jealously guarded.

The only way to reduce failures to a minimum is exhaustively to examine into each individual failure, and, like the G-Men, track it down determinedly and unremittingly to its primary cause, no matter how apparently insignificant it may be. Some railroads have made splendid progress in reducing failures by such methods, following up, of course, by changing the practices or designs to eliminate the sources of trouble. Sometimes the investigations led into odd and unanticipated places.

In recent months we have published several articles on Locomotive Failures by Fred H. Williams of the Canadian National Railways. Just as the G-Men have specialized to a high degree in the tracking down of

public enemies, he has specialized in running down failures of locomotives and rolling stock. The compound microscope and other special devices have been drafted for his use.

There are men in the medical profession who specialize in making physical examination and diagnoses. They search for the causes of our physical ills and then turn us back to the family physician or a specialist for treatment. Mr. Williams is doing much the same thing in locating the weak spots and sources of trouble with cars and locomotives. Once tracked down, they are then referred back to the designer, maintainer or operator for correction.

Thus far in his studies of locomotive failures—side rods and driving wheel tires—he has taken some pointed shots at the back shop in its machining practices. Is he right? What have the shop men to answer to these indictments? Are his points well taken or would a trial before an impartial judge and jury find the back shop guiltless? Can such insignificant details as he has pointed out be responsible for such disastrous results? If he is right, is it because of lack of proper facilities or equipment in the back shop and engine house? What is your opinion?

Standardize Lubricants

While not so specifically stated, the inference to be drawn from the discussion of railroad lubricants at the railroad session of the spring meeting of the American Society of Mechanical Engineers at Dallas, Tex., seems to be that pet theories and fads incorporated in the specifications are costing the railroads a lot of money. If the different railroads would waive some of their peculiar requirements in the specifications for freight-car lubricants, for instance, and would agree upon a common standard, a considerable cost in producing and carrying in stock a variety of oils would be eliminated.

According to the experts, and they apparently base their conclusions on thorough investigation and research, there is little, if any, difference in the practical lubricating qualities as between the great variety of specifications now insisted upon by the different railroads. Moreover, it is claimed that an oil suited to either summer or winter temperature conditions can be produced which will prove little if any more expensive than the present oils—possibly less so because of producing and carrying in stock only one variety.

There are few questions of greater importance to the railroads than this problem of lubrication for cars and locomotives. Much scientific study and research have been carried on in this field by the oil producers and distributors, since the railroads are among their largest customers. It would seem that the research division of the Association of American Railroads could render a large service by fostering cooperative endeavor between the oil interests and the railroads in developing common standard specifications for lubricants, and in educating the railroads to the value and importance of adopting and supporting such standards. Fads and fancies now incorporated in some of the specifications are too expensive and troublesome to be tolerated in these days when there seems to be strong evidence that they do not make for increased efficiency or economy.

There are no other phases of the lubricating problem which are also of prime importance. Special attention should be given to improving the design of the equipment to insure the more effective application of the lubricants, and also in training the forces in the best methods and practices for their efficient use. With higher train speeds and more intensive use of the equipment these matters are of extreme importance.

NEW BOOKS

ELEMENTS OF DIESEL ENGINEERING. *By Orville Adams. 450 pages, 6 in. by 9 in. 284 Illustrations. Bound in cloth. Published by Norman W. Henley Publishing Co., 2 W. Forty-Fifth St., New York.*

In this volume, prepared by a consulting Diesel engineer of wide experience in the field, the reader is offered a textbook which covers in detail the current applications of Diesel engines from the fundamental principles of design and operation to the actual maintenance and repair problems met with by the operating engineer. The twenty chapters of the book cover seven major divisions of the subject; viz, History of Diesel development; elements of Diesel operation and definitions; fuels, fuel-injection systems and combustion; engine construction, maintenance and lubrication; Diesel development, with particular reference to high-speed engines such as used in railway service; operation and maintenance of automotive Diesels, and field maintenance of automotive Diesel auxiliaries and accessories. A feature of this book, which should appeal particularly to one interested in a study of Diesel engines is the fact that each chapter is accompanied by a complete group of questions and answers—over 300 in the entire volume—which discuss fully the important points in the text. Illustrations and diagrams covering working parts and the construction and operation of all major classes of Diesel engines are generously provided.

PROCEEDINGS DIVISION V—MECHANICAL, *Association of American Railroads. Published by the Association, 59 East Van Buren Street, Chicago. 1,090 pages. Price, $5 to members; $10 to non-members.*

The proceedings of the Division V—Mechanical just issued by the Association of American Railroads, Operations and Maintenance Department, for the session held at the Congress Hotel, Chicago, June 26 and 27, 1935, contain also recommendations, letter ballots and other transactions for the years 1933 and 1934, during which years no member meetings were held because of prevailing business conditions.

THE READER'S PAGE

Largest Fireless Locomotive

To the Editor:

With regard to Mr. LeFevre's letter concerning fireless locomotives in the *Railway Mechanical Engineer* of April, 1936, it may be of interest to note that in 1924 the Baldwin Locomotive Works built an 0-6-0 fireless locomotive weighing 171,790 lb., for the Dallas Terminal Warehouse of the Gulf, Colorado & Santa Fe Railway. This engine must be very nearly the largest of its kind.

William T. Hoecker.

Can Match Walt Wyre

To The Editor:

I get quite a kick, so to speak, out of the Walt Wyre stories about the troubles and headaches of the Plainville outfit; also the comments on these stories by your readers.

I fear the critics, or most of them, take the yarns as everyday happenings and forget that Walt Wyre has only one story a month. On the other hand, from experience I would suggest that if Jim Evans and the others at Plainville only have one bad day a month, they have good reason to pat themselves on the back and feel lucky.

I am employed at a small junction where most of the trains have work to do. Some start and end trips here, and some turn. In all, we have about 40 trains every 24 hours. The yard is only about 45 cars long, but some of the trains have about 100 cars. Eastward they all go out on one line; westward on three lines. If I were good with a pen I could easily write a headache story at least once a week about some of us at this point, that would equal Walt Wyre's Plainville yarns.

Block Operator.

Back Shop Foreman Speaks

To the Editor:

Recent issues of the *Railway Mechanical Engineer* have had many articles commenting on the trying conditions under which the enginehouse foreman labors.

We of the back shop will agree that twelve hours is too long for any foreman to work, day after day. During the past depression, when the back shops were closed down, the foremen were laid off and at times were actually in dire need. At the same time the enginehouse foremen were drawing fair salaries and they did not complain about any over hours. Of course, they felt sorry for the foremen of the back shop, but they did not offer to put out a helping hand. Now that conditions are better, every department is working normal and the hard worked enginehouse foremen seem to want to vent their feelings.

The back shop foremen could tell a lot about meeting strenuous conditions and how, in an effort to help them out, they have handed over time after time to the enginehouse foremen, parts which have been assembled on their outgoing engines.

Let's hear from some of the back shop foremen. These enginehouse foremen are no harder pressed and do not work under pressure any more than you do.

We asked for work, we are getting it, and we enjoy the urgent demand for power. Here's hoping it keeps up! Let them bring on the work; we of the back shop can take it standing up!

Back Shop Foreman.

Heat-Treated Tires and Truck Wheels

To the Editor:

Recently another problem has been added to the machine shop foreman by the adoption by the railroads of what is called "heat-treated tires and truck wheels." It seems that as soon as the metallurgists develop some better grade of tool steel, the material manufacturers go them one better and manufacture harder materials.

Possibly some of your readers could give the rest of us useful information pertaining to the machining and mounting practices. In our shop it has been found necessary to change all previous practices, both in machining and in pressure allowances. With the old type truck wheel, 12 to 14 were bored in an eight-hour day on a car wheel boring mill using a Davis boring bar, at a speed of 30 ft. per minute, .125-in. feed for roughing and .180-in. for finishing. No difficulty was experienced using a good grade of high-speed steel.

There appears to be a wide variation in the hardness and toughness of the bore in the heat-treated wheels. By reducing the speed to around 20 ft. per minute some can be bored without any difficulty; on others, even with the best grades of cutting steels now available, it is extremely difficult to get a smooth, true and parallel bore. Recently, out of four wheels, two were bored with high-speed steel at a speed of 20 ft. per minute, .062-in. feed and were within .001 in. of being straight and parallel, although it took several cuts to secure this accuracy. The other two were roughed out the same way, but because the tool wore so fast we could not get a straight bore.

Five different makes of high-speed steel were used, with practically the same results, and, as a last resort, we tried a tantalum-carbide tool bit, which, with light cuts and feed, eventually got a satisfactory finish.

For pressure-fit allowance we used—previous to the heat-treated wheels—a formula of .001 in. to the inch diameter of the bore, which would give the tons pressure required. To get the same pressure with heat-treated wheels we have found that only about half the allowance is required, depending on the hardness of the metal. On the four wheels previously mentioned—the bore was 8 in. diameter—.004 in. was sufficient allowance for the two hard wheels, but on the two softer ones, .005½ in. was required to give the same pressure.

May we not hear from other shopmen on this subject?

Machine Shop Foreman.

Gleanings *from the* Editor's Mail

The mails bring many interesting and pertinent comments to the Editor's desk during the course of a month. Here are a few that have strayed in during recent weeks.

Open the Flood Gates

Your editorial, Open the Flood Gates, sure made a hit. Some of the comments which I overheard other readers make included, "That sure hits the nail on the head"; "That certainly applies to persons that I know of"; etc.

A Sound Pension System

If your paper could advocate a pension for railroad men to be handled by the railroad companies themselves, I think it would be preferable to the present plan. My suggestion is that the railroad and the employees get together and have each pay a certain proportion each month to a pension fund that will cover all employees; each railroad to handle its own pensions independent of any government interference.

Welding Tires

You occasionally publish photographs or particulars of failures which have taken place, such as the photograph of a broken tyre, which appeared on page 51 of your issue for February, 1936. It is interesting to find that a breakage has actually taken place due to welding tyres, as the possibility of this occurring has, so far, deterred us from using this method of building up flanges. The process would be a very economical one, having regard to the amount of tyre which has to be turned away to restore the flanges to their proper thickness.—*From an English Reader.*

French Engine Drivers

Also, and this is important, a French engine driver is an artist at his work. He just does not climb into the cab, pull the throttle and let her go. From the moment that he starts his locomotive, until the end of the run, every minute of the time he is on his job working, studying, maneuvering his engine to get the very most out of it and save his fireman. They give him the necessary instruments and he can watch and knows exactly what is going on from throttle opening to exhaust tip. A great deal of the fine results obtained is due to the way the French engine driver operates his engine.

What Is a Car Foreman?

In the April issue I notice a contribution signed "Car Foreman." As a back-shop man during the past 25 years, I have occasionally heard the expression "car foreman," but I have never actually come in contact with one, nor ever heard just what they are, or how they got that way, or where they come from, or what they do. Perhaps I may be wrong, but if I ever have given the matter any thought at all, I have supposed their main job was to sign the work tickets of those men who run up and down, hitting car wheels with hammers every time a train stops at a depot. Perhaps I am mistaken. Will you please let us locomotive shop men know more about what a car foreman is?

Safety Devices Pay Well

It seems to me that all railroads contemplating a program of locomotive improvements when the prosperity corner is reached would do well to consider safety devices as well as speed producing and tonnage boosting equipment. Most of us can hark back to the days when the work of installing the water column and second water glass was carried out, and there is no question but that the water column is a proven safety device that has paid for itself many times over and has been a contributing factor in the decrease in the number of low water accidents during the past few years. And now it should be apparent to all thinking railroad men that every modern locomotive should be equipped with proven boiler safety devices. According to this engine-house foreman's way of thinking, the railroads have reaped the largest dividends from their investments in safety.

The Fuel Bill

Greater space should be devoted to the item that costs the railroads the most money—the fuel bill. There is hardly an operation of the railroad that does not find its way into the coal account. If the car repairer in the shop puts on a brake shoe that touches the wheel and causes some friction, it is contributing its small part to the heavy pulling of the train, which takes more coal. When the conductor or flagman gets to the train a few minutes late, account of waiting for the bill or some other reason, the engine has to make up this time, and to do this, burns more coal. This is so on down the line, and when the final bill is rendered it is a tremendous expense. The steam locomotive, at its best, is a crude piece of machinery, although the most economical means of power we have to date, and no doubt, will be with us for a very long time; so in view of the ever increasing prices for coal, this is a subject that could be dealt with every month. If we can hammer at the subject long enough to get everyone thinking, there can be tremendous savings and better performance.

Haste May Make Waste

A bright young machinist, recently out of his time, was placed on the 90-in. tire turning lathe, the regular operator being off because of illness. At the end of the first week I said to him, "Bill, you are not getting out as many tires as old Joe did."

"No, sir," he replied, "I am not, but I'll bet you that the tires I do turn out are not going to cost you as much in the long run."

"How come, Bill?" I asked.

"Well," he replied, "these 66-in. heat-treated tires cost about $100. each. They are 3½ in. thick and are scrapped when they are worn to 2-⅜ in. Is that right?"

"Yes, go on."

"Well then, each 32nd of an inch of what you use costs you about $2.75, just doing the calculation in my head."

"Go on. What about it?"

"Well, if I get in a great hurry and try to do a pair an hour as I hear they do in some shops, and in so doing take off only 1/32 of an inch more than is absolutely necessary, the whole set of eight tires would have about $22. worth of good tire wasted. These fast records cannot be made without getting the tool well under the scale or low spot, and it is quite easy to take off as much as 1/16 of an inch too much if you are only thinking of speed and how many tires you can turn in a given time. Fifteen minutes of extra time per pair is, I believe, well spent, don't you?"

"Where did you learn all this stuff?" I asked.

"Oh, in the classroom, before I was out of my time."

"Well, Bill, you may be right. I am going to check it up."

Now, what in heck am I going to tell Bill?

Failures of

Locomotive Parts*

By F. H. Williams†

TIRES like shoes wear out in time, but there are some that come to an untimely end. Such failures result from several causes and may range from new tires to those that are worn near the limit. In this article only one class of failures will be considered—those due to "transverse" tears of the metal caused by rough machining of the bore of the tire. In contradistinction to the marks of the cutting tool in the direction of the cut, gobs or hunks of metal are torn out in the roughing cut, which leave pits or tears at right angles to the line of the cut. These may be classed as transverse tears.

In boring a tire the roughing cut is followed by a finishing cut. Much depends upon both of these operations. If in taking the roughing cut the metal is badly torn, the damage done may not be removed by the light finishing cut and the tire may fail in service.

An examination of Fig. 1, which is an enlarged view of the bore of a tire that failed, will indicate that the metal was rather badly torn in making the cut, resulting in the so-called transverse tears, pieces of metal being gouged out. The effect of this may be illustrated in an exaggerated way by considering a rather unusual

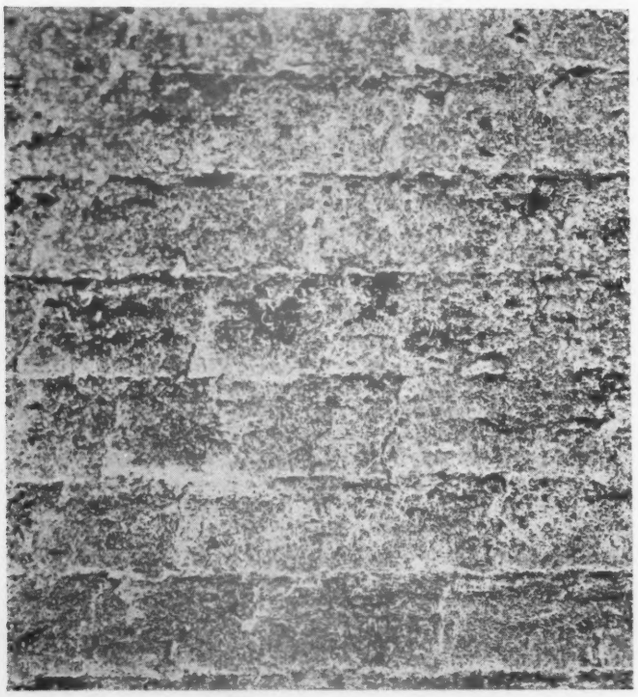


Fig. 1—Greatly enlarged view of the bore of a tire that failed because of rough machine finish

experiment. Tests have proved that a polished finish on a test piece will prevent failure under impact at -70 deg. C., but the slightest tool mark in the test piece will cause it to fracture like glass at the same temperature.

The bores of tires vary as to contour. The more angles or edges there are, the more danger spots if the work is not properly done. Sharp corners should be avoided. Rounded edges and fillets should be used with a smooth finish. Tools must be kept properly sharpened and the light finishing cut should remove all tears made by the roughing tool. Such tears, especially on the edges, may cause fatigue cracks. Even small fatigue cracks, ⅛ in. deep, will cause the tire to break, and this may mean considerable damage to rolling stock and perhaps loss of life.

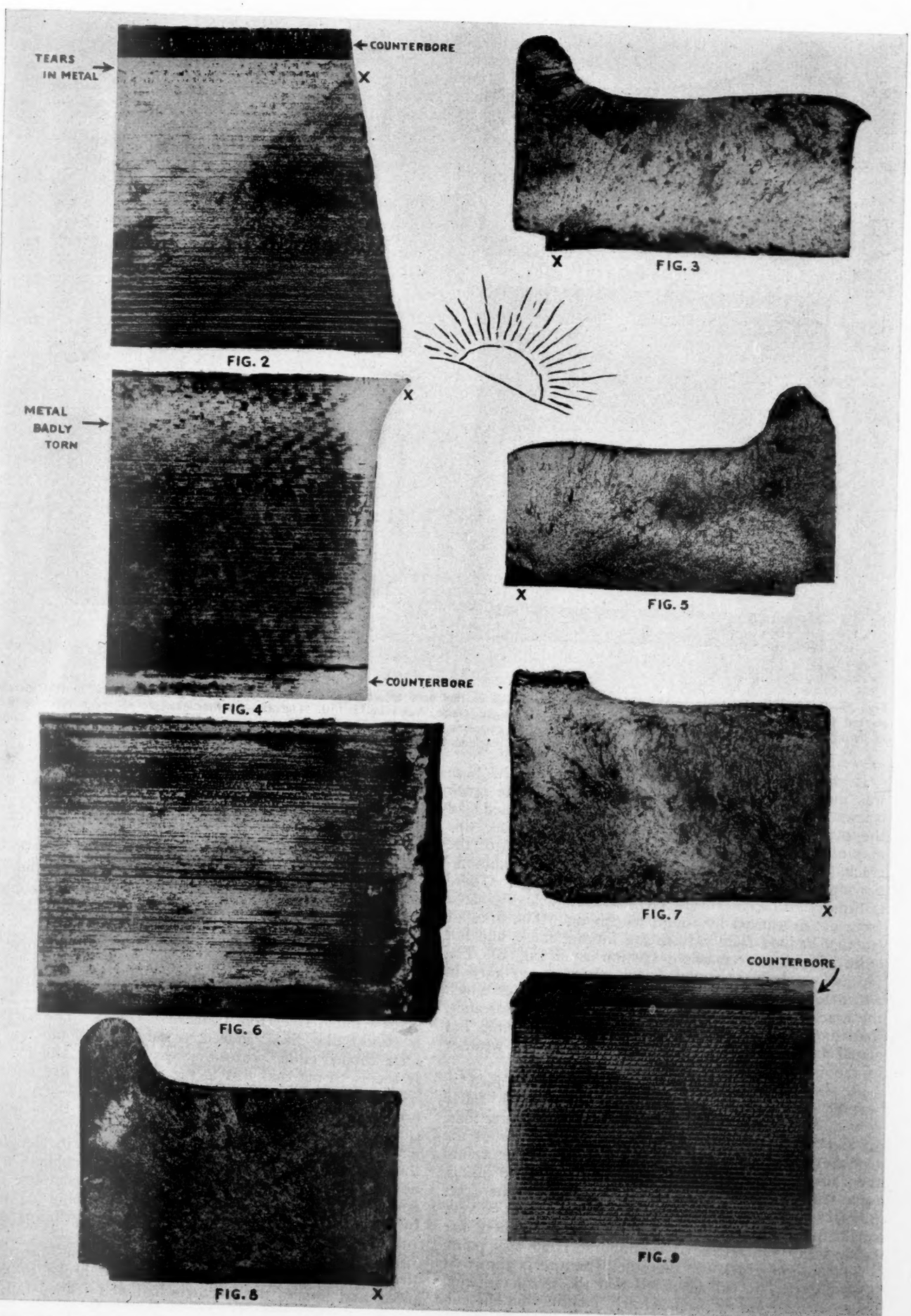
With this introduction, let us examine some typical photographs that clearly illustrate the damage caused by lack of proper machining.

A section of the inside of a tire which was machined with a coarse feed, the tool not cutting freely, is shown in Fig. 2. Tears in the metal can be plainly seen in several places, especially near the counterbore (the darker section), which itself has a rough and torn surface. Part of the bore, particularly near the bottom of the photograph, is fairly smoothly finished. The fatigue crack started at X, Fig. 2, as is clearly shown in the lower left-hand corner of Fig. 3, just at the edge of the counterbore. The nucleus of this fatigue crack, however, is about half the width of the fatigue crack from the edge of the counterbore; as indicated in Fig. 2, the metal was badly torn at this place. It will be noted that the fracture radiates from the fatigue crack like a sunburst, and it is therefore safe to conclude that this failure resulted from the fatigue crack, which in turn originated in that part of the bore of the tire where the metal was badly torn by improper machining.

Fig. 2—View of inside of tire; dark section at top is the counterbore. Fatigue crack started at X because of tears in metal by rough machining. Fig. 3—Fatigue crack at X started from rough finish shown in Fig. 2; fracture radiates from it like a sunburst. Fig. 4—This finish in the bore of the tire is somewhat finer than that shown in Fig. 2. Fatigue crack started at X. Note the tears in the metal. Fig. 5—Cross-section of fractured tire, the machine finish in the bore of which is shown in Fig. 4. Fatigue crack nucleus at X. Fig. 6—Shows machine finish in bore of tire which was fractured in several places. This finish is fairly smooth, as compared to previous illustrations. Fig. 7—This small fatigue crack in the tire, the machine finish in the bore of which is shown in Fig. 6, started at the sharp corner. Note the sunburst effect in the fracture. Fig. 8—Another fatigue crack in the tire shown in Figs. 6 and 7; not at the sharp corner in this instance. Fig. 9—This tire, with its rough finish in the bore, broke in nine places, four of the fractures showing well-defined fatigue cracks

The finish of the bore of the tire shown in Fig. 4 is finer than that shown in Fig. 2. It will be noted, however, that cross tears are quite apparent, particularly on the side opposite the counterbore (the upper part of the photograph). It was here that the fatigue crack started, as is indicated by the dark spot at X, in the photograph of the cross section of the broken tire, Fig. 5.

* Part III of an article which began in the May issue.
† Assistant test engineer, Canadian National Railways.


TEARS IN METAL
COUNTERBORE
X
FIG. 2
X
FIG. 3
METAL BADLY TORN
X
COUNTERBORE
FIG. 4
X
FIG. 5
FIG. 6
FIG. 7
X
COUNTERBORE
FIG. 8
X
FIG. 9

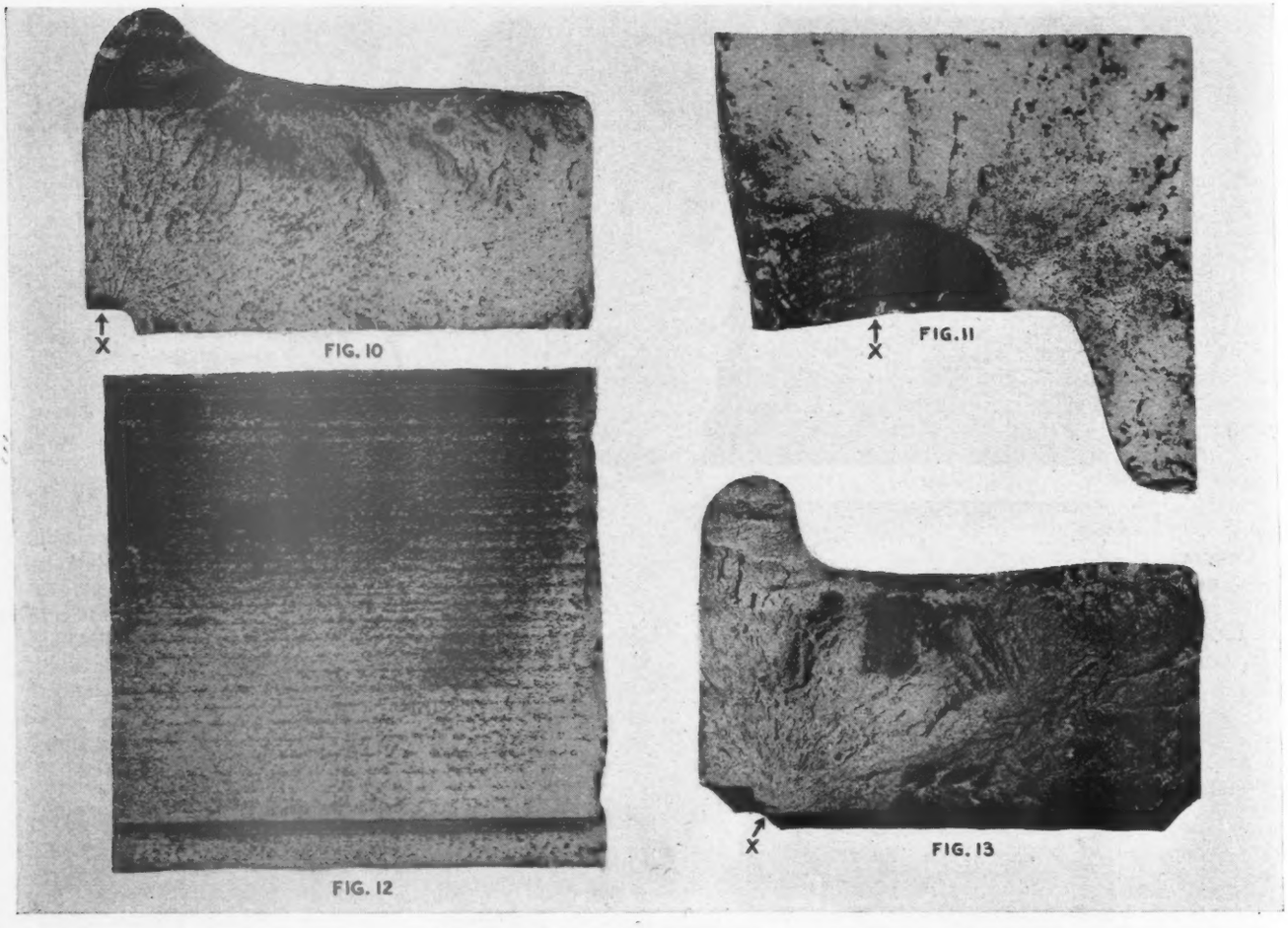


Fig. 10—One of the fractures in the tire, the machine finish in the bore of which is shown in Fig. 9. The fatigue crack in this instance started in the counterbore. Fig. 11—Enlarged view of fatigue crack shown in Fig. 10. Fig. 12—Another example of rough machine work in boring a tire. The roughness is smoothed somewhat by corrosion. Fig. 13—This fatigue crack may appear insignificant, but it caused the tire to fracture. The machine finish of the bore is shown in Fig. 12

It should be noted, also, that this edge of the bore was quite sharp. The possibilities of a fatigue crack originating in this point might have been lessened had the sharp corner been rounded off. In this case this may not have had anything to do with the origin of the crack, however, since the nucleus on critical examination appears to be about ¼ in. from the edge. There is little question, however, but that the crack originated from a tear caused by rough machining. The lines of fracture radiate faintly from the fatigue crack, and not quite in such a pronounced fashion as in Fig. 3. The fatigue crack was corroded, but there is no way in which to ascertain the length of the period over which the crack developed. It is quite possible, for instance, that such a crack may start in the summertime, but actual failure may not take place until severe weather in the following winter.

A photograph of the bore of a tire that failed in several places is shown in Fig. 6. This is a fairly smooth finish, compared to the previous illustrations. In addition to the roughness, however, the edges of the tire are sharp, no attempt having been made to round them off. The tire was fractured in at least two places, each originating in a fatigue crack. One of the fractures, which started in the sharp corner with a very small fatigue crack, is shown in Fig. 7. There are fairly clear indications of a sunburst from this point.

The fatigue crack for the other fracture is shown at X in Fig. 8. It will be noted that the usual radiating lines extend from the fault, clearly pointing out the culprit. This was almost a new tire and the bore was fairly satisfactory as to quality of finish, except that it was not good enough. It strongly emphasizes the importance of better finishes in the boring of tires.

How to Insure Better Finish

I have heard that some railroads are resorting to grinding the bores of tires. This sounds reasonable, especially if it is not possible to secure a suitable finish otherwise.

One of our major shops is rough boring with a ⅜-in. feed, two tools cutting $^{3}/_{16}$ in. each. A finishing cut is then made with a tungsten carbide or similar tipped tool, at the rate of 150 ft. to 250 ft. per min. This gives a finish free from transverse cracks. The surface is almost like glass; indeed, a kid glove would not be torn, rubbed either with or across the faint tool marks. It seems to me that this is the solution of tire boring. The operator, however, must be on the alert. A properly used tool will finish from 300 to 400 tires, but a careless operator can destroy one in a moment of forgetfulness. If such a tool is not allowed to complete the circumference on the last turn, it is ruined; this, however, furnishes a positive check on the complete finish of the bore. A tire can be bored in about 20 min. by this method. It is thus quicker than grinding and just as satisfactory, if not better.

Another example of a rough finish of the bore of a tire is illustrated in Fig. 9. This tire broke in nine pieces and four of the fractures had well-defined fatigue

cracks. There is no question but that failures were caused by the rough finish. One of these failures is shown in Fig. 10, the fatigue crack starting from the counterbore. Here, again, the sunburst effect, radiating from the crack, is clearly evident. An enlarged view of this particular fatigue crack is shown in Fig. 11. A close examination of the dark area indicated that it was plainly a fatigue crack, starting from the tool marks.

Another example of rough boring is shown in Fig. 12. This surface was somewhat corroded, so that the tool marks do not show as clearly as they otherwise would. This particular tire broke in two places. One of the fractures started from a fatigue crack, which is shown in Fig. 13. This is only a small crack and may appear insignificant, yet it did result in the fracturing of the tire.

"Why did we not have more tire failures in the past, when the tire boring was done even more roughly?" This is a question that I have been asked. In the first place, it is questionable if the machining was rougher than some of that illustrated in this article. If, however, we grant that the tires are not so roughly finished today as in the good old days of the past, we must remember that the service to which they are subjected is much heavier today. With this more severe duty it is quite essential that every precaution be taken to insure smooth boring.

The use of tungsten carbide tools has proved that tires can be bored quickly and cheaply and that an almost glass-like surface can be obtained. It does not require long to finish the bore of a tire at a cutting speed of 150 ft. to 250 ft. a minute, and tools costing a few dollars each will bore several hundred tires. At this rate a single tire can be bored in from 20 to 30 min. We must not forget, also, that it is extremely important that all sharp edges be properly and smoothly rounded off.

In this particular article I have referred only to locomotive tires. As a matter of fact, however, a passenger car tire seldom fails from fatigue cracks in the bore. In the first place, the machine finish is ordinarily far better than any illustrated in this article. Passenger car tires do fail, but generally from other causes. A consideration of the causes of passenger car tire failures will appear in a later article.

So You'd

Rather Be a Puritan?

(This article requires some explanation. The publication of the Roundhouse Foreman's Daily Log in the *Railway Mechanical Engineer* of May, 1935, page 207, started a lively discussion in our columns. Not all of the contributors agreed with the writer of the "Log." He, on the other hand, has remained quietly in the background, but apparently doing a lot of thinking. He is a bit of a philosopher. Here are his conclusions—EDITOR.)

Imagination is, we are told, one of the few characteristics which distinguishes man from other animals. From the imagination of Doctor Rudolph Diesel came the principle of the prime mover which other imaginations have harnessed to the railroad's new and successful bid for passenger transportation supremacy. It was, no doubt, Doctor Diesel's imagination, turned morbid, that caused him to disappear from a ship crossing the English Channel less than a year before engineers the world over began to accept his valuable theories and practices. Let us, then, be not bashful about exercising our own fancy.

Sounds Like a Big Promotion

Suppose that we are summoned to the office of a manufacturing executive, told that we have been recommended to him for a place in his organization, and we hear the position outlined as follows: "The sole responsibility for the successful operation of from 25 to 40 mechanical units will rest on you. These units cost about $85,000 each when new, and their average is 16 years. Our figures show that they have been repaired, periodically, but the years of use have removed something from these machines which is not, economically, replaceable. This fact, however, will not be accepted as a reason for poor performance. The plant in which you will maintain these units represents an investment of a quarter of a million or so dollars. You will have a staff of about 40 men, and an operator and an assistant will be allowed whenever an additional unit is put into production."

This, to us, begins to sound like a real job; we have seen and heard of plant managers; maybe those diligent years are going to be rewarded. Some of those things we have so long wanted may come our way. The kids can go to college when they grow up. The wife can go ahead with her delayed social and church work. We can join a service club or the country club.

But, There Are Limitations

The executive continues: "Your judgment as to forces and materials will be curtailed; your suggestions and requests will be supervised by this office. You will be required to maintain the units so that any, or all of them, can be put to work on short notice from the production department; and once started, they must continue to produce until the work is completed. Failure of a unit while in production may mean loss to us and will surely reflect discreditably on you. Considered on an hourly basis you will be paid about the same as the mechanics under your direction, but we will allow you to work twice as many hours, twelve or more every day, each day of the week. Even at that your pay will be less than that of the machine operators.

"We are not offering a chance to work into a partnership as a substitute for low salary. There are no partnerships. The only possibilities, so far as advancement is concerned, are more responsibility, with a small increase in salary. We have men working in similar positions who, after 20 years, are earning as much as 20 cents an hour more than their mechanics. You have about one chance in one hundred of becoming one of the district supervisors and your chances of occupying this office are, to say the least, remote. Advancement depends on your learning how to avoid difficulties, or their consequences. There are any number of natural occurrences for which you may be removed from your position—without notice."

The Answer Is "No!"

Now let us imagine what our reaction to such a proposition would be. Those dreams which started themselves during the first part of the explanation died a sudden death and we might doubt the man's sincerity in expecting to find one having the qualifications obviously demanded by the position, who would be willing to waste his talents on such an endeavor. We might suspect that the job required a stronger, more enduring back, rather than the discerning mind we had thought they desired the use of—that this executive wanted a Samson, rather than a good mechanic with well developed supervisory ability. We might even be mildly insulted by deducting, from the hours of service demanded and the salary offered, that our time was the only valuable element the organization could find in us, that the only qualification considered in selecting us from among our fellows was our supposed willingness to sell to them another third of our lifetime.

The answer to that proposal is not hard to imagine. Coming from an organization outside the one in which we were trained, the answer would be definitely, "No."

But—In Railroad Service

Perhaps, though, coming from our own company it would sound something like this: We are summoned to the office of the master mechanic and are given the following invitation: "We need a roundhouse foreman, do you think you can handle the job?"

The answer to that is, just as definitely—"Yes."

And why not? We are going to be boss. Our ability is challenged, our vanity is touched, our loyalty and devotion have been recognized. It is promotion! This is our big moment, and let us savor it well, it may be the last moment of elation that will come of our "success." This instant of heady happiness has got to compensate for hours of wearisome worry, has got to be stretched to carry us through those times when some failure or other causes us to wonder if we are the man we thought we were when we said "yes" to the master mechanic.

What Will the Doctor Say?

On our way home to ask the wife to exult with us, provided of course that we have been able to contain ourselves and not phone her the good news, let's do something a bit unconventional, let's stop at the doctor's office to get answers to a few questions that a sensible man might ask. The doctor examines us and reports that we are in reasonably good health, so we'll ask him for suggestions as to how to maintain that health. Do you believe that he will recommend working twelve hours a day, seven days week? Not on your tintype, or on mine. Will he say that eating at least one meal every day while under a mental strain will cause our digestive organs to prosper, that a delayed dinner once or twice a week will ward off ulcers?

If we tell him that we are going to spend ten of the twelve hours on our feet will he call it moderate exercise or over-indulgence? No! He will probably tell us that our project is one of the world's best ways to court premature old age, and should he be an experienced life insurance examiner he will unquestionably suggest that such an occupation will reduce our life expectancy by ten or more years. Should he be a nerve specialist, he'll make the ominous prediction that very few years will pass before we are pleading with him for a cure for nerve disorders which severe physical and mental effort, combined, bring on, and which his science has not yet conquered. If he is the family physician, he might suggest that we start payment now for the treatment that we will certainly be in need of at some later time.

How About the Psychologist?

From this interview let us go to a psychologist to find out if we are heading for a normally happy mental life. Here we'll be told that several of man's psychological needs will be fulfilled by this work. Ascendancy over a group of fellow men will satisfy our ego, the mental stimulus toward action will certainly not be curbed, the natural will for material accumulations will be gratified in a way, and mental growth will for a time be stimulated. Aside from those conditions, we will learn that our mental life is lopsided as our other existence. If C. C. Furnas were consulted he might quote from a chapter of his latest book "The Next Hundred Years".

"Remember that for the average man work is drudgery, there are many thousands of more interesting things to do than earn one's daily bread. One passes this way but once and there should be opportunity to do a few of the things that one enjoys, the first requisite of opportunity is time—that means leisure—relief from the daily grind (note that I say leisure—not idleness). If there is anything in being alive—certainly a considerable portion of each year should be available for indulgence in the activity most desired—bridge, fishing, gardening, swimming, climbing, sailing, puttering, collecting any of the absurd things that are collected, reading, writing, plumbing, tinkering, singing, social uplifting—anything except work. . . . No budget would be complete without an allowance for recreation. In all worlds except the Puritan it is an item of great importance, hardly ranking with food but still well up in the list. . . . Leisure is much more important than an extra car—an extra ton of food—extra suits of clothing—radios, canoes or what not."

Let us reflect for a time upon these statements and their relation to our projected position. First we realize that in the sense Mr. Furnas uses the word, we want to be "average". The opposite, in this instance is maniacal, and we are not yet ready to join the ranks of the mentally unbalanced. By resorting to the most elementary of mathematics we can establish our opportunity for leisure, or lack of it. We are going to be on the job twelve hours, we are going to use at least one hour getting to work and back, and there is that inexorable demand for sleep to be reckoned with. It has been lately proven that the sleepless marvels of the past invariably nodded and napped enough during the day to bring their total unconscious hours up to the normal eight. We've got to spend part of the remaining three hours on routine care of this body from which we expect so much, so possibly two hours of the day belong to us, and it is a safe bet that nothing more rigorous than plain and blessed idleness is going to claim these hours most days.

How About the Time Budget?

This is our time budget, and if we do take time out to indulge in a bit of enjoyment, some item on that budget must suffer. We belong to the working classes and have always known that life is, mostly a serious proposition, but are we prepared to accept such unremitting seriousness? We have always realized that "Life is not all beer and skittles", but if we must forego the beer, wouldn't an occasional game of skittles be refreshing?

It is to be remembered that we are undertaking a daily program, so where is that "considerable portion" of our time for recreation? We are going to have two week's vacation—maybe—and another good bet is that those two weeks are going to restore neither our equanimity nor our vigor, that we will return to work with very little more sparkle in our eye or spring in our step than there was when we left. Of course these things are by no means essential, they are just among the nicer things in life that others have and we would like to have.

The result of our problem in addition and subtraction shows that we are going to trade about nine-hun-

dred and ninety nine of every thousand things that other men like to do, for the job. This a polemic statement, but a careful perusal of the letters and comment from engine house foremen, published in the *Railway Mechanical Engineer* during the past year will substantiate the premise that in the great majority of cases it is the closest approximation of existing conditions.

It seems that we are going to be, with the exception of our work, in the curious position of living in a modern world, in a developed, highly civilized nation, yet not be able to partake of the finer attainments of that civilization, for the spreading of which the organization to which we belong has been largely responsible. Our company may transport actors and actresses, or their filmed activities to the theaters of our town, speakers to our auditoriums, and books to our libraries, but not for us. We may know now that Robert Burns and Van Dyck are the names of men who did something besides get their pictures on cigar boxes, but we'll soon forget it.

A Call on the Pastor

Now, if we should see the pastor of our church, as we go home, let us quietly cross the street, for from now on we are going to get our religion vicariously. To those who would argue that man has a spiritual side which needs attention, we must turn a deaf ear. We can console ourselves with the often used equivocation that we can be a practical rather than a practicing Christian.

We cannot be certain just what dictated the reduction of hours for all classes of labor from twelve hours to ten, then to eight; strikes, admittedly were a factor. Whatever the cause, it is undeniable that, considering the national welfare as major among accomplishments, the change turned out to be sound economics. Labor leaders are now urging the six-hour day; when this is achieved, are we going to be working two full shifts? Successful men in all lines quite frequently tell interviewers that their success is due to having always delivered a little more than was expected, usually by studying or working a little after the required hours. We are, according to that hypothesis, automatically excluded from further advance, for in accepting the job we have offered all our available hours, have contracted to deliver the last ounce of expendable effort.

We may consider that the offered regime is calculated to train us for a bigger, better position and we may oppose that with the conclusion that the training period will be not only exhaustive—but exhausting; that we will know the condition that every athletic coach has learned to avoid, that of being trained too fine.

What to Tell the Wife?

After these consultations and reflections, what are we going to tell the wife? Simply that we have been promoted. After all, we may be that one out of a hundred who goes on to a minor executive's place; may be that odd one who is going to be chief mechanical officer, and even if we aren't, we are young, the job is *now* and the breakdown is in the nebulous future. Besides—we can use the extra money, and we wouldn't like to have it noised about the plant that we were afraid of the job, or have the lunch time sessions condemn us for not "being able to take it".

From the Managerial Viewpoint

Now, while the throttle on our imagination is still wide open, let us ride for a few miles on the other side of the track. Assume that we are the executive about to hire a manager for our plant. Are we going to feel safe in turning it over to a man who, by accepting that sum as annual salary, admits that he is worth less than one-tenth of one per cent of the investment in the plant? There is very little of the routine about the job and are we being consistent in demanding twelve hours of efficient supervision from the man on it?

Are we going to admit that all phases of railroading have changed by spending millions of our company's dollars on new equipment, then deny that change by insisting that the new machinery be maintained in the manner of 1880? Are we going to accept and profit by the advances of scientists in the exact fields, then jeopardize those profits by refusing to accept the findings of practical industrial psychologists with regard to that most important item, the human machines we use? There are available charts of human efficiency just as comprehensive as any of these thermal efficiency diagrams for engines we have studied. Are we going to learn of the amazing drop in the human efficiency curve after six hours service, then be blindly inconsistent in demanding one hundred per cent production from a plant in which the efficiency of the leaders is less than fifty per cent for half of each day?

There has always been a supply of potential foremen. There have always been more machinists that wanted to be foremen than there were jobs for them. We worked twelve, fourteen hours a day when we were foremen, didn't we?

Is past existence of any condition ample justification for its continuance? How many shippers are going to continue to patronize a road that refuses to speed up its schedules just because the present ones have been followed for many years past? We do need something more in our foremen than willingness to spend their time—a great deal more; can we assume that the supply will be perpetual? We might observe the relentless trickle of our younger, better mechanics into other lines and see that in the coming regrowth of industry our staffs are going to be raided, unless we make the positions more attractive. We are, right now, experimenting more than at any time for many years; we have tried many solutions for our equipment maintenance problems, might it not be good business to try a reduction in foremen's hours as an experiment in human engineering?

Let us, as a final consideration, realize that the majority of foremen will never be more than that; that the odds quoted by our prospective foreman hold true, that there is only one master mechanic in a hundred and that there are only four or five embryo mechanical department officers in all the plants of our company. With regard to these four or five, is it not plausible that one of the reasons why so few mechanical department executives ever advance beyond their department is that they are so busy tending to their own job that they haven't time to learn the other phases of railroading?

There are those who will impugn the imagination which conceived this colloquy as being fully as morbid as Dr. Diesel's in his last days. Let them, too, reflect. Do they not number among their acquaintances several ex-foremen who have been returned to the ranks, either by the management or by their own request; do they not know men who have been demoted because of loss of physical or mental activities; can they not point to numbers of has-beens, or has it not been their experience to observe more foremen die in harness than in the comfortable retirement, to which their years of effort should have entitled them? Let those men who have not observed such things spend the time they would use in attacking these ideas, in congratulating themselves, for they are rare indeed.

It is not our intention to insist that railroad foremen cannot appreciate that it is a grand world, full of good things, that they are barred from all enjoyment of life—it is only that their appreciation and enjoyment must be largely primitive.

BE SAFETY MINDED
"JUMP THE PIT" SAYS IMPULSE
CHOOSE THE SAFE WAY
DUMB STUNTS SHORTEN LIVES
MOVING TRAINS CAN'T THINK!
MEN WITH BRAINS CAN STOP TRAIN SERVICE ACCIDENTS
STRUCK
AND SURE FOOTED
LOOK AND LIVE
RUN OVER
MAN ALIVE!
LOOK BOTH WAYS BEFORE LIGHTING AND KEEP ON LIVING
WOULD YOU STAND FOR THIS?
NO!
NO!
THEN WEAR GOGGLES
HAND WORK WITHOUT HEADWORK
6,036 Employees injured in one year handling Rails, Ties, Bridge Timber etc.

SIGNS OF SAFETY

"WHY, it's—it's deplorable! Absolutely deplorable!" Master Mechanic Carter of the Plains Division of the S. P. & W. pounded the table and glared at the three foremen seated across the table from him as though daring them to dispute the fact. "Nine personal injuries in five months, three of them reportable! It's deplorable, I tell you! Nearly twice as many as we had in the mechanical department at Plainville all last year, and every one of them preventable. How am I going to explain it? I'm asking you! How do you expect me to explain such a record?"

John L. Starkey, the general foreman, squirmed and cleared his throat. Jim Evans, the roundhouse foreman, bit off a hunk of horseshoe and edged his chair over towards the cuspidor. Bob Parker, the night foreman, was first to speak.

"Well, only one of the reportable injuries happened at night."

"Yeah? A hostler helper fell off the top of a locomotive when he was fixing to put sand in the dome of the engine. Broke three ribs and got all skinned up. It's a wonder he wasn't killed. That was on your shift."

"The light over the sand crane wasn't burning and he couldn't see. We need more lights around the place. When I was on the Big Four—"

"Never mind the Big Four, Mr. Parker. What do

Wilson came up by the side of the firebox just in time to meet a gush of flame

you say, Mr. Starkey? You're the general foreman. After all, it's up to you to explain why we are having so many personal injuries in the roundhouse here at Plainville,—and how to stop them," the master mechanic added.

"Well, I don't know. I've tried to make things as safe as possible. We've had guard rails put around all gears and pulleys. I've had the painter make up some large safety first signs."

"Seems like I heard something about one of them signs. The one on the pole by the arch brick house; somebody bumped into one corner of it with an eye. Came very near being another reportable injury," the master mechanic said sarcastically.

"Yes, they put it up just a little too low. I've had it raised high enough so there's no more danger of that," Starkey explained.

"Well, I'm giving you fair warning. Accidents must be reduced. I want you to hold a formal investigation of every man that gets hurt on the job. Find out why and how the accident could have been prevented. That's all."

Next morning Starkey called a meeting of all employees. He told them in part what the master mechanic had said. After the meeting he gave orders to the painter to make up a lot of signs bearing safety slogans to be posted around the shops. He called the safety committee in the office and talked to them. He told them to watch out for unsafe conditions and report them to him.

by Walt Wyre

The safety committee took the general foreman at his word. Welding screens were overhauled and new ones made. Guard rails were placed on the turntable and around the drop-pit. Holes in the floor were repaired. Jacks were turned in to be overhauled. Members of the committee seemed to vie with each other each trying to find the most things that might possibly cause an accident.

THEY went two weeks without an accident. Starkey was beginning to congratulate himself that every safeguard had been provided and accidents a thing of the past. Then Wilson, a coppersmith helper, got hurt. The fire builder was putting a fire in the 5092, an oil burner, as are all of the engines on the Plains Division. Wilson came up alongside just in time to meet a gush of flame from the fire-box. His face was badly burned, blistered solid on one side. He lost two weeks and they thought for awhile his right eye would be damaged.

The fire builder claimed he yelled "look out below for a fire on the 5092." The oil didn't ignite right at

once and he opened the firing valve a couple more notches. Then it flashed. Wilson claimed he didn't hear the fire builder yell. Anyway, it was another reportable injury.

Carter raved. Starkey had more signs painted and bulletins posted until the roundhouse looked like a highway intersection two miles out of town. The safety committee renewed their activity with a will. One of them proudly suggested that fire builders be provided with a whistle, like traffic cops use, to signal when he was going to light a fire in an engine.

Starkey bought the whistles himself,—three of them,—and gave one to the fire builder on each shift. The fire builders blew lustily when lighting a fire, and lots of times when they weren't. Some of the men learned to imitate the whistles and the place sounded like Times Square in New York at five p. m.

In the meantime Evans was having troubles enough of his own while the general foreman was making his safety first campaign. Business was going good, but the engines were not. He was about four engines short for the number of trains they were running and locomotives had to be dispatched in many instances without proper repairs. March winds were whipping sand and dust across the prairies. Hot pins and boxes were daily occurrences. Rain and snow had fallen, even in unusual quantities in some sections of the country, but not along the Plains Division. The country was dry as a popcorn ball and the sand as light. Piston packing cut out quickly in spite of increased lubrication.

Altogether more repairs were needed. The stores department, buying on the basis of previous consumption, was short on repair parts. Material was being constantly ordered to be shipped by passenger, heavy material like pistons, piston rods, valve castings, and bull rings. At that there were numerous occasions when engines had to be held waiting parts.

While Evans was busy trying to divide twenty trains into eighteen engines and make them come out even, Starkey was busy with his safety campaign. He was getting results, too. That is, far as the records showed. There had been no more reportable injuries since Wilson got burned. There had, however, been a flock of minor injuries—mashed fingers, twisted ankles, and such. Of course Jordan getting his arm hurt would have been a reportable injury if he had not come back before three days were up. Starkey put him to sorting and indexing blue prints until his arm got so that he could use it. He was running a lathe at the time it happened. He was chucking a brass to make a knuckle pin bushing and left the wrench sticking in the chuck when Reed, another machinist, stopped to talk to him. While they were talking Reed absent-mindedly pushed the starting button of the motor-driven lathe. The wrench struck Jordan on the wrist, almost breaking it. He stayed off two and a half days and spent the rest of the week sorting blue prints.

THE next reportable injury that showed on the record happened one Sunday. Evans was running the place alone and short-handed on account of reduced force. He had just gotten his lineup and called the dispatcher to let him know what engines were to be used when the dispatcher called him back.

"There's going to be two sections of No. 10 tonight," the dispatcher said.

Evans swore and hung up the receiver. As it was, he just had enough engines to go around and the extra section made him one short. He took a fresh chew of horseshoe and sat down to figure it out.

"Well, let's see. The 5074 is doped to get in about ten o'clock on 81. I can get her for first 10. The 5086 will be on the first section, she's a good engine. We can run her through on the second section without changing the lineup. Yeah, that'll get it," he told John Harris, the clerk. "Guess I'll take a turn through the house to see how things are going," he added.

The phone rang insistently just as Evans started to open the door. He paused to see who it was and what they wanted. It was the dispatcher and he wanted to speak to the foreman.

"Yes, Evans talking . . . What!" The foreman gripped the telephone receiver so tight that his knuckles were white. He reeled as though stung on the forehead by a hornet. "All right," he said weakly, and hung up.

"What is it, Mr. Evans? Something wrong?" the clerk asked.

"Not much; just the 5074 tore herself up—driver tire broke—the train is tied up on the main line at Wister. Give the caller an engine crew. I'll see how the 5090 is getting along." Evans left the office like he had hot coals in his hip pocket.

The 5090 had a fire in her. The needle had just left the peg. The foreman told the fire builder to hook up another blower on her and get the engine hot quickly as possible. Then he thought of the two sections of No. 10. There was only one thing to do—get another engine for the passenger train. The 5078 was due to come off the drop-pit the next day. Evans looked her over and decided that by calling in a couple of machinists and helpers he could get her ready. Boiler work was O. K. He went back to the office and told Harris to call the four men.

"We're already over on our allowance for this month," the clerk reminded him.

"Can't help it; we've got to get an engine for No. 10," Evans replied and bit off a hunk of horseshoe that would have choked a billy-goat.

The machinists went to work with a will on the 5078. Rods were ready to go up when they started. They had finished putting up the rods on the left side and were getting ready to start on the right. They had all of them lined up alongside the engine. Then it happened. Another reportable injury! A side rod turned over and caught a machinist's helper's foot right across the instep. Evans had the man taken to a doctor at once. Two broken bones in the foot. He'd be off at least three weeks, the physician said.

Looks like that was enough for one day, but trouble hadn't finished with the place, not by a long shot.

The 5084 was finished about four-fifteen. Jenkins, a machinist, ran the valves over.

"How is she?" Evans asked.

"Well, looks like she's pretty badly out," the machinist replied.

The swearing Evans did then would have been an inspiration to a top sergeant in the army. He swore by ear, by note, and with variations. After he was out of breath he took the tram and ran the valves just to be certain. The machinist was right. The valve rod would have to be shortened 5/16 of an inch. The blacksmith wasn't working. By the time he could be called and get the job done it would probably mean a serious delay. And wouldn't that be nice! An engine failure, a reportable injury, and a delay on the Limited all in one day. Carter would have six conniptions and probably a stroke of apoplexy when he heard about it.

Evans took a walk to collect his thoughts. The machinist and helpers took advantage of the foreman's absence to climb up in the cab for a smoke. Jim strode down through the house leaving a stream of tobacco

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juice in his wake. He reached stall number nine, then turned and headed back so suddenly that he made three steps before his shadow caught up with him. The machinists and helpers saw him coming and slid out of the cab.

"Here, Jenkins," he said to the machinist. "Make a bushing for the valve rod."

"That's a new one in it," the machinist said.

"Here; I'll show you what I want;" Evans went on, "make a bushing for this valve rod and make it eccentric. You can either turn the outside first or the inside, don't make any difference, but the hole wants to be thrown 5/32 of an inch off center. When you press it in, have the thin side of the bushing toward the rod. That will shorten the travel 5/16—"

"I see it," Jenkins replied and headed for the machine shop.

When the bushing was finished, the engine trammed perfectly. A dowel was put in so that the bushing couldn't turn and the engine was ready to go. Evans instructed the rod cup man to use plenty of grease on all bushings. After the hostler had run the engine up and down the lead long enough to limber the bearings up a little, the foreman looked over all the bearings. Any that showed signs of running hot were doused with valve oil. Evans gave the engineer an extra pint of valve oil and his best wishes and called it a day.

NEXT morning when Starkey learned what had happened the day before he turned pale around the gills. All morning he was jittery as a June bride waiting at the church for a delinquent groom. Every time the telephone rang, the general foreman jumped.

Evans, too, was worried, but no use getting excited, he figured. That wouldn't help matters any. Anyway, he was too busy to put in much time crying over spilt milk. Bemoaning accidents and engine failures that had already happened wouldn't wipe them off the records nor prevent the occurrence of others. The thing to do, he reasoned, was to figure out why they had happened and prevent a recurrence. As he made the rounds, Evans subconsciously pondered over the reason for the many personal injuries in the Plainville roundhouse.

About two-thirty in the afternoon the general foreman was sitting at his desk eating aspirins and figuring out some new signs and bulletins to be posted around the shop. When the telephone rang he came out of his chair like a jack in the box.

John Harris, the clerk, answered the phone. It was the call Starkey had been looking for all day. The master mechanic wanted the foremen in his office at three o'clock.

"Now, the first thing I want to talk about is engine failures," Carter began. "We had another one yesterday, a disgraceful failure on one of our best trains, a broken driver tire on the 5074. Starkey, what do you have to say about it?"

"Er-ah-I don't see how it could have been prevented," the general foreman began uneasily. "I have examined the broken pieces and can't find any indication of an old crack. I wasn't working yesterday," he added.

"I was!" Evans spoke up, a little angry at the obvious attempt of the general foreman to pass the buck.

"Well, perhaps you can explain why the tire broke on the 5074," Carter glared.

Evans rolled his cud of horseshoe around to a more comfortable position. "Yes, I think I can explain. The tires on the 5074 are too thin."

"They are not down to the limit, are they?" the master mechanic asked.

"No," Evans replied, "but they nearly are. They are too thin for heavy passenger service. We just took a chance and lost."

"I'll look into that later," the master mechanic said. "The main reason I called you men in was account of personal injuries. Another reportable injury yesterday. They've got to be stopped. What about it?"

Starkey squirmed uneasily in his chair. As general foreman it was his duty to answer the master mechanic's questions, and he didn't know just exactly what to say. "Well, I am having some more bulletins posted and signs put up," he said.

"I don't care just how you go about it. What I'm interested in is reducing the number of personal injuries. If we can't reduce the number some one is likely to take our jobs that can," Carter said significantly. "What's your idea on improving our personal injury record, Evans?"

"Seems like we are going at it from the wrong angle," the foreman replied, glancing at Starkey.

"Evidently there's something wrong," Carter said sarcastically. "Maybe you can tell us what it is and how to correct it."

Evans flushed at the thrust. "Yes, I think I can tell you what's wrong. Instead of teaching every man to work, think, and act safety, we are really teaching them to be careless."

"Why, I've had bulletins posted and signs put up urging safety on the part of every employee," Starkey cut in.

"Yes, that's true," Evans replied, "but seems to me that we have overlooked the idea of making every man feel that it's his personal problem to reduce injuries. We have put guard rails around this and that and shields over everything we could think of until the men unconsciously feel that it is no longer up to the individual. It's the same way with signs and bulletins. They no longer pay any attention to them."

"Do you mean gears should not have shields over them and belts should not be guarded?" Carter asked.

"No, not exactly," Evans replied, "but such things can be carried too far. When they are, the men get a feeling of security that breeds carelessness. Take the guard rails around the turntable. Outside of being a blamed nuisance, they haven't stopped injuries. Here's what I'm getting at. A safe worker is the best safety device possible."

"I've got that on one of my signs," Starkey interrupted.

"Yes," Evans replied evenly, "that's true."

"Well, what would you suggest to remedy the situation?" the master mechanic cut in.

"Well, my idea is to educate the men; impress on them the fact that it's not entirely our job to see that they don't get hurt. A careless worker can find some way of getting hurt in spite of safety devices."

"That's just what I've been trying to do," the general foreman interrupted.

"Yes, that's true," Evans said. "We've been carrying on a safety campaign without letting the men in on it, that is, with the exception of a few of them. The men on the safety committee don't get hurt. That's because they feel it's part of their job."

"Don't you think bulletins and signs do any good?" Carter asked.

"Yes, sir," Evans replied, "long as they have something to say that will interest the men. But I do think that after a sign or bulletin has been up so long that it is sort of a permanent fixture every one ignores it. Just like the posts in the roundhouse. Everyone knows posts are there, but no one pays any attention to them.

I'd suggest tearing down all old bulletins and signs, bulletins especially. Then keep the bulletin board up to date and change the signs occasionally.

"Is that all you have to suggest?" the master mechanic asked.

"No; I'd suggest that in order to make every man feel that it's part of his job we have a three-minute meeting every morning at eight o'clock for a time, at least. Call on different employees for talks on safety. Chances are the speeches wouldn't amount to much, but the men would go to work thinking about safety, and that's what counts. As soon as they realize that dangers exist and it's their job to avoid them, I believe our record will improve." Evans bit off a hunk of horseshoe as he waited for the master mechanic's reply.

"O. K.," the master mechanic said. "We'll try your plan thirty days and see what happens."

Two months later Carter proudly displayed the banner awarded the roundhouse at Plainville for going thirty days without a single personal injury.

A One-Hand Portable Electric Screw Driver

A small, light-weight, portable electric screw driver, capable of driving all sizes of screws from No. 4 to No. 12 by simply changing the finder and bit, is being introduced by the Independent Pneumatic Tool Co., 600 W. Jackson Boulevard, Chicago. This new Thor U16 electric screw driver follows the design of the U14 electric drill recently placed on the market, and incorporates several new features in an electric screw driver. All weight is concentrated at the operator's hand, eliminating overhanging weight and providing easy, untiring operation with "finger-point" accuracy, making it a real

Thor portable electric screw driver

one-hand tool. The smallness of the screw driver, only 10½ in. overall, permits use in places ordinarily inaccessible. A powerful motor, dependable tension adjustment, hand-wound armature and special commutator construction, provide efficient operation.

Ball bearings and heat-treated helical gears reduce noise and vibration to a minimum and increase motor efficiency. These features also reduce the heat generated. The Thor ventilating system provides effective cooling of the motor which increases the power by enabling the motor to pull, without overheating, a sustained load close to its maximum capacity.

This tool has a free speed 700 r.p.m. and weighs complete with screw driving attachment 3½ lb. It is equipped with No. 250 slip-clutch attachment.

Pedestal Grinders For Carbide Tools

Two new pedestal grinders—a 6-in. and a 10-in. grinder—designed for the grinding of cemented carbide tools, are announced by Carboloy Company, Inc., Detroit, Mich. They have been developed to meet the requirements necessary to grind carbide tools more rapidly and without injury to the carbide tip and are said to be suitable not only for resharpening tools dulled in ordinary use but also for the rapid reconditioning of carbide tools on which the tip has been accidently broken, the reshaping of carbide tools, and the rapid grinding of milled and brazed carbide tools (milled and brazed tools are carbide tools finished except for the grinding operation).

The 6-in. grinder is designed for the interchangeable use of silicon-carbide cup wheels for roughing and fin-

The 10-in. Carboloy pedestal grinder

ishing, diamond wheels, and lapping discs. It is intended for plants having carbide tools in the smaller size range-up to about 5/8 in. square—and a relatively few larger sizes of tools. The 6-in. grinder also supplements the larger 10-in. grinder for plants whose tools require reconditioning on diamond wheels or lapping discs. For such work all sizes of tools can be accommodated.

The 10-in. grinder is designed for both peripheral grinding on straight wheels (silicon carbide) and face grinding on silicon-carbide cup wheels. Both roughing and finishing can be done on the one machine.

A few of the more outstanding features claimed for these machines are: (1) Provision for rapid wheel changes when necessary; (2) Vee-belts made accessible for quick changes or adjustments by simply removing one wheel guard and side louvre; (3) Exhaust outlets provided for rapid connection to blower systems; (4) Both grinders provided with tool rest tables sufficiently large to accommodate all sizes of tools, and in each case

the tables extent well beyond the face of the cup wheels and around the periphery; (5) Both the 6-in. and 10-in. grinders have reversible motors which facilitate grinding of either left or right hand tools; (6) Motors are mounted inside pedestals of both grinders and are insulated to eliminate vibration, and are dust protected; (7) The 6-in. grinder is provided with reservoir and needle valve for lubrication of diamond wheels.

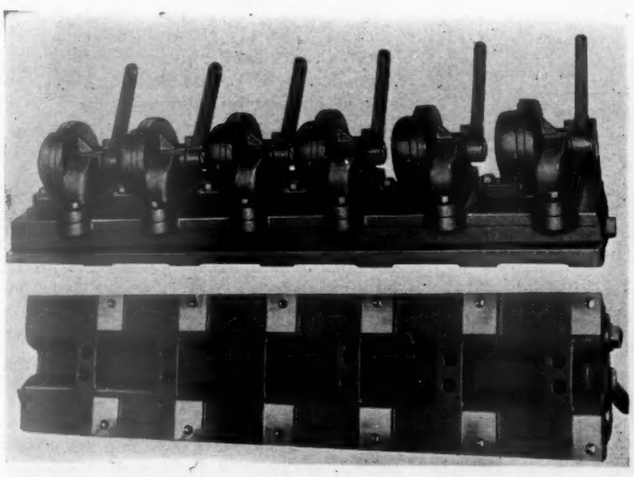
Manifold Air-Control Valve

A valve for the control of compressed air or hydraulic equipment, developed by the Hannifin Manufacturing Company, Chicago, comprises a type of "Packless" manifold valve of unusually compact construction and arranged for a simple piping installation. This valve is for the control of six double-acting air cylinders from a single point on a Jordan spreader. Other types are available for the control of any number of cylinders on air or hydraulic equipment used in railroad shops. The base of the valve is one piece, with inlet and exhaust ports at the ends and cylinder ports in the bottom. Piping can be arranged in the simplest manner with minimum number of connections. Inlet and exhaust connections can be made at either end of the base. Manifolds can be furnished with any number of valves required.

Hannifin "Packless" air control valves are of simple, efficient design, with a minimum number of parts and no packing whatever. The bronze disk which controls the air flow is ground and lapped to make a perfect seal with the seat which is similarly finished. This effective design prevents leakage and maintenance troubles. The disk and valve seat are restored to original efficiency by simple re-lapping at infrequent intervals.

Manifold valves are available in three-way and four-way types. Type MK has 45-deg. movement and no shut-off position, air being admitted at all times to one side or the other of the air cylinder. The Type MV has 90-deg. movement with outlets open to the exhaust when the lever is in the shut-off position. The Type MP has 90-deg. movement with the outlet and exhaust ports closed when the lever is in the shut-off position.

Besides its use for the control of compressed air and hydraulic equipment, the manifold valve is said to be well adapted to the control of fluid and gas handling and pumping operations, filling and emptying storage tanks, and many similar uses.



Hannifin manifold-type Packless four-way air control valves for the unit-position control of multiple air or hydraulic cylinders

High Speed Turret Lathe

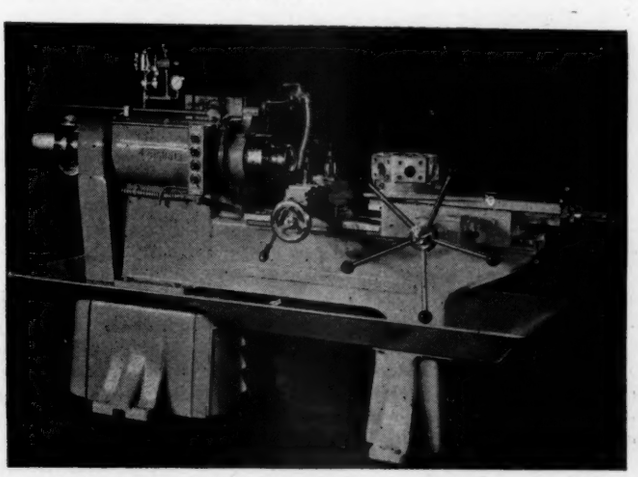
A simplified high-speed turret lathe for a wide range of both ferrous and non-ferrous material machining jobs has been designed by the Gisholt Machine Company, Madison, Wis. This machine is intended for both quantity production and small lots, is of the same general design as the Gisholt No. 3, No. 4 and No. 5 universal turret lathes and embodies many of the same labor saving devices. The automatic collet chucking capacity for round, hexagon and square stock is 1½ in., 1⅜ in. and 1⅛ in. respectively, and uses either an 8-, 10-, or 12-in. scroll chuck. The machine has a maximum of 18½ in. swing over the steel-topped ways.

A feature of this machine is its drive. Primarily designed for high-speed work, all gears and clutches have been omitted from the spindle and headstock. The spindle, mounted on tapered roller bearings, is driven by vee belts directly from the motor mounted in the cabinet under the headstock. These belts drive an aluminum sheave which is mounted on the spindle back of the rear bearing. This sheave is so mounted that it can be quickly removed and replaced by another of different diameter, varying the speed in much the same manner as would be done by pickoff gears. A corresponding change is made in the motor pulley with an adjustment of the motor mounting to compensate for belt length. A variable diameter motor sheave can also be supplied. By these means exactly the correct speed for any desired diameter can be secured so as to utilize cutting tools to the best advantage and to minimize the inflexibility of the variations for which two- or four-speed motors are wound.

Control of the spindle is by means of a push-button panel on the headstock, providing start, stop, reverse, and the various speeds of the motor.

The hexagon turret and its stop roll are automatically indexed to the next position with a back movement of the slide. As the slide advances to the work, the hexagon turret is automatically located and clamped in place. The operator need not take his hand from the pilot wheel to accomplish this whole operation. The machine is offered with either power-feed turret or hand-feed turret, the latter being the more usual. The saddle may be clamped to the bed at any position suitable to the work.

Three types of hand-operated cross slides are offered and any one may be furnished with or without hand longitudinal adjustment to suit requirements. The three cross slides are lever operated, screw operated or a combination of lever and screw.



Gisholt 18-in. high-speed turret lathe

The "Silver Jubilee" of the London & North Eastern leaving Newcastle station at the same time as the 10 a.m. Manchester and Liverpool express

Globe photo

NEWS

Eastern Car Foreman's Association Outing July 23

THE Eastern Car Foreman's Association will hold its annual golf tournament and field outing on Thursday, July 23, at the Race Brook Country Club, New Haven, Conn.

W. H. Winterrowd Honored

THE honorary degree of Doctor of Engineering was conferred upon William H. Winterrowd, vice-president of the Franklin Railway Supply Company, by Purdue University at its recent commencement. Mr. Winterrowd was graduated from that institution in 1903 with the degree of bachelor of science in mechanical engineering. The citation for his honorary degree read: "Engineer of high repute, executive of recognized achievements, humanist of inspiring example."

Dedication Ceremonies for "City of Denver"

DEDICATORY ceremonies for the streamliner "City of Denver," placed in service by the Union Pacific on June 18, were held in Chicago and Denver. The ceremonies in Chicago took place in the Chicago & North Western station between 4:30 p.m. and 5:00 p.m., eastern time, while those in Denver were held simultaneously at the Union station in that city. The ceremonies at both cities were broadcast over the National Broadcasting Co. network.

New York Law Requires "Helper" on Diesel Engines

GOVERNOR Lehman of New York has signed the bill passed at the recent legislative session, which amends the New York State railroad law, so as to require a two man crew on "fuel-electric" (Diesel) engines.

N. Y. C. "Mercury" Christened

THE New York Central's new streamline train, the "Mercury," was christened at Union station, Indianapolis, Ind., on June 25 by Miss Louise Landman, daughter of L. W. Landman, general passenger traffic manager of the road. She broke over the nose of the Mercury's locomotive a bottle of champagne from Sandusky, Ohio, which is along the route the train will cover on its proposed regular run between Cleveland, Ohio, and Detroit, Mich., via Toledo, Ohio. The Mercury is expected to go into regular service on a daily round trip on July 15.

Pennsylvania Wins Modernization Contest Award

THE Pennsylvania has won second place in the Forbes Magazine "$200,000,000 Industrial Modernization Contest," it was announced recently at the prize presentation ceremonies held in New York. First prize, the "Modernization Cup," was awarded to International Business Machines Corporation. The award to the Pennsylvania was based on its program for scrapping 32,000 old freight cars and replacing them by 10,000 new all-steel cars of advanced type, thus providing 11,000,000 man-hours of work for employees in the durable goods industries. Upward of $200,000,000 has been invested in plant modernization programs begun or completed this year by approximately 100 corporations which participated in the contest, it was revealed at the prize presentation ceremonies.

New Haven's "Comet" a Year Old

THE New York, New Haven & Hartford's "Comet," streamlined train now making six round trips week days between Providence, R. I., and Boston, Mass., celebrated its first birthday on June 5. During its first year the Comet has traveled more than 133,000 miles; it started originally with five round trips each week day, but beginning last September a sixth round trip was added. On Sundays the train has been used frequently for special excursions which have totaled 12,000 miles. Approximately 100,000 persons have ridden on the Comet.

Double-Deck Trains in Germany

THE Lübeck-Büchen railway in Germany has recently placed in service two two-car double-deck streamline trains hauled by a 2-4-2 type tank locomotive. The new trains, says a description published in a recent issue of the Railway

Gazette (London), are designed for a maximum speed of 74.6 m.p.h. and may be operated without shifting the locomotive from one end to the other; an operator's compartment has been built into the front of the car which leads when the train is running with the locomotive at the rear, and electric remote control apparatus is employed to operate the engine. The passenger seats on the double-deck cars provide accommodations for 258 third-class and 42 second-class passengers. The lightweight cars, which are but little higher than those of normal design, are built of high-tensile steel and the framework is welded throughout; trucks are fitted with roller bearings.

Designing for High-Tensile Steels —Corrections

In Table II in the second column on page 181 of the May issue of the *Railway Mechanical Engineer* the factor of safety at the top of the second column should be 1.813 instead of 1,813.

The second formula near the top of the first column on page 183 should have a decimal point before 52 in the denominator, thus

$$\frac{P}{A} = \frac{15000}{.52 + \frac{1}{16190}\left(\frac{L}{r}\right)^2}$$

In the formula for P/A in the third paragraph in the first column on page 246 of the June issue the factor before L/b in the denominator should be .005 instead of .055.

In the explanation of terms immediately below equation (24) in the second column on page 246 the last item should read:

I = Moment of inertia, in.[4]

New Equipment

Locomotive Orders

Road	No. ordered	Type of locomotive	Builder
Boston & Maine	3	600-hp. Diesel-elec. switchers	Electro-Motive Corp.
Portland Terminal Co.	3	600-hp. Diesel-elec. switchers	American Locomotive Co.
Southern Pacific	6[1]	4-8-4 passenger	Lima Locomotive Works
	12[1]	4-8-8-2 freight	Baldwin Locomotive Works

Locomotive Inquiries

Central of Brazil	2 or 3	4-10-12	.....
Green Bay & Western	3	2-8-2	.....
Toledo, Peoria & Western	4	4-8-4	.....

Freight-Car Orders

Road	No. of cars	Type of car	Builder
Cornwall R. R.	20	70-ton hopper-ore	Bethlehem Steel Co.
General Chemical Co.	3	50-ton tank	American Car & Foundry Co.
Merchants Despatch, Inc.	500	Refrigerator	Merchants Despatch Trans Co.
Northern Pacific	500	Gondola	Pressed Steel Car Co.
	250	Flat	Company shops
Southern Pacific	250	Auto-box	Mt. Vernon Car Mfg. Co.
	500	Auto-box	General American Trans. Corp.
	500	Box	Pressed Steel Car Co.
	500	Box	Pullman-Standard Car Mfg. Co.
	500	Box	Bethlehem Steel Co.
	250	Box	American Car & Foundry Co.
	200	Flat	Company shops
	100	Gondola	Company shops
Standard Oil Co. of N. J.	6[2]	10,000-gal. tank	Pullman-Std. Car Export Corp.
	5	12,000-gal. tank	General American Trans. Co.
	5	2-comp.—8,000-gal. tank	General American Trans. Co.
Union Pacific	1,000	Underframes[3]	Ryan Car Co.
Wheeling & Lake Erie	500	60-ton twin hoppers	Pullman-Standard Car Mfg. Co.
	500	60-ton twin hoppers	Ralston Steel Car Co.

Freight-Car Inquiries

American Railroad of Porto Rico	7	.....	.....
Central of Georgia	200	50-ton hopper	.....
Chicago Great Western	100	50-ton flat	.....
E. I. duPont de Nemours & Co.	1 to 5	70-ton tank	.....
International Rys. of Central America	150 to 300	12-ton banana	.....
Lehigh & New England	250	50-ton hopper	.....
Norfolk & Western	1,000	Box	.....

Passenger-Car

Road	No. cars	Type of car	Builder
Southern Pacific	20	80-ft. baggage-horse	St. Louis Car Co.
	Two 12-car trains[4]	Streamline	Pullman-Standard Car Mfg. Co.

[1] To be equipped with Buckeye six-wheel tender trucks.
[2] For service in Brazil.
[3] For 50-ton box.
[4] To be placed in daytime operation between San Francisco, Cal., and Los Angeles about January 1. The trains will be powered with high-speed, streamline steam locomotives, and, complete with reserve motive power, will cost approximately $2,000,000. Each train will include chair cars, a parlor car, a parlor-observation car, a dining car and a tavern car. They will be air-conditioned throughout. The tavern car, which will be a separate unit, will be of unique and original design, with lunch counter facilities at one end and lounge space, equipped to serve refreshments and beverages, at the other. Each train, to be named the Daylight, will have a capacity for 465 passengers.

Supply Trade Notes

Iron & Steel Products, Inc., Chicago, has purchased the North Works of The Ryan Car Company, at Hegewisch, Ill., including buildings and 27 acres of land.

The Metallizing Company of America Inc., Los Angeles, Cal., has opened a new branch office at 407 Call building, San Francisco, under the management of E. T. Parkinson.

J. Carlisle MacDonald has become associated with the executive personnel of the United States Steel Corporation as an assistant to Myron C. Taylor, chairman of the board, in respect to public relations, with headquarters at New York.

The Hutchins Car Roofing Company, Detroit, Mich., and the Chicago-Cleveland Car Roofing Company, Chicago, have merged under the corporate name of the Chicago-Hutchins Corporation, with general offices at 332 South Michigan avenue, Chicago.

The general offices of the Fruit Growers Express Company, the Western Fruit Express Company, the Burlington Refrigerator Company and the National Car Company have been moved from 1259 Munsey building, to 1101 Vermont avenue, Washington, D. C.

E. S. FitzSimmons, manager of sales of the Flannery Bolt Company, Bridgeville, Pa., has been appointed vice-president; W. C. Masters has been appointed sales engineer; Leo Finegan, eastern sales manager, and W. M. Wilson, western sales manager.

The Armstrong Cork Products Company and the Corning Glass Works have entered into a selling arrangement whereby the former will act as sales agent in the equipment insulation field for the latter company's refined wool insulation, consisting of glass fibres.

The Alfol Insulation Company, Inc., New York, has opened Chicago offices in the Field building, 135 South LaSalle Street. D. D. Grassick has been appointed district supervisor in charge of the new Chicago headquarters. Mr. Grassick was formerly in the employ of the Santa Fe in the mechanical and car construction department for 11 years, and from 1926 to 1931 was railway and industrial sales manager of the Insulite Insulation Company. Since 1932 he has been located at Cleveland as transportation sales representative of the Philip Carey interests.

John C. Stewart, supervisor of insulation sales of the United States Gypsum Company, with headquarters at Chicago, has been promoted to manager of railroad sales, with the same headquarters, the department being newly created to coordinate the merchandising and servicing of United States Gypsum products to railroads.

George I. Fisher, for the past eight years with the Haskelite Manufacturing Corporation, has joined the new Technical division of the Algoma Plywood & Veneer Company, Algoma, Wis., with duties as an engineer, also sales promotion and advertising work. He will act as direct assistant in the Chicago office to James R. Fitzpatrick under whose direction the Algoma Technical division was recently established. The Detroit, Mich., office of this division is in charge of G. M. Hanrahan.

J. W. GLEASON has resigned as general manager of the Knapp Bros. Mfg. Company, Joliet, Ill., to become associated with the Rawlplug Company, Inc., New York. Mr. Gleason was assistant general sales manager of the Kalman Steel Company for five years and sales engineer of the General Fireproofing Company for seven years. Prior to that he was employed by the Northwestern Expanded Metal Company and the Link Belt Company.

WILLIAM P. EWING, vice-president in charge of sales of the Superior Steel Corporation, Pittsburgh, Pa., has been promoted to executive vice-president, a newly created office, and has been succeeded by L. W. Briggs, who has resigned as general manager of sales of the West Leechburg Steel Company. David Pryde, manager of works of the Superior Steel Corporation, has been promoted to vice-president in charge of operations.

H. C. MCELHONE, for the past five years attached to the president's office of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., and who has served in various capacities in the works, headquarters sales, stock control and executive departments, has been appointed assistant to vice-president. During recent months Mr. McElhone has been in charge of Westinghouse Golden Jubilee Year activities.

PAUL D. MALLAY has been appointed manager of the Insulation Division, eastern district, of the Gustin-Bacon Manufacturing Company, Kansas City, Mo. Mr. Mallay was for many years chief engineer of the Transportation Department of the Johns-Manville Sales Corporation and subsequently vice-president of the Geo. A. Nicol Corporation. The eastern headquarters of the Gustin-Bacon Company are at 401 North Broad street, Philadelphia, Pa.

THE SAFETY CAR HEATING & LIGHTING COMPANY, New York, has announced the following personnel changes: Charles W. Walton, for 23 years secretary and treasurer of the company, at his own request relinquishes the responsibilities of those positions and, after 35 years of continuous service to the company, retires from active business. Herbert K. Williams, assistant to president, has in addition been elected secretary, his headquarters remaining at New York. William Stewart, assistant secretary and assistant treasurer, has been elected treasurer and assistant secretary, with headquarters remaining at New Haven, Conn. John H. Michaeli, formerly assistant to vice-president of Safety Refrigeration, Inc., a subsidiary of Safety Car Heating & Lighting Company, has been elected assistant secretary and assistant treasurer, with headquarters at New York. In addition to the above corporate changes, the following also became effective July 1: H. D. Donnell, representative at San Francisco, Cal., has been appointed manager of the Pacific Coast sales district with headquarters remaining at San Francisco. Joseph E. Haskett, who has been attached to the headquarters staff in New York, has been transferred to the Pacific Coast sales district, with headquarters at San Francisco. Arthur R. Hamilton, representative in the Chicago sales district, is transferred to New York as assistant to Mr. Williams, and Eugene Leherissey, formerly with the engineering and inspection department at the New Haven Works, is transferred to the Chicago sales district, with headquarters at Chicago.

KARL HERRMANN, vice-president and general manager of the Bantam Ball Bearing Company, South Bend, Ind., has retired, and has been succeeded by A. H. Frauenthal, assistant general manager. Mr. Frauenthal entered the employ of the Bantam Company in 1930, previous to which time he had been quality engineer of the Studebaker Corporation and chief inspector and metallurgical engineer of the Chandler Motor Company. Since entering the employ of the Bantam Company he has served as sales engineer, divisional manager in charge of sales engineering and manufacturing and assistant general manager.

A. H. Frauenthal

Mr. Herrmann is retiring in accordance with plans made when the Bantam Ball Bearing Compnay was consolidated with the Torrington Company. He will be retained as a consulting engineer. He entered the employ of the Bantam Company in 1929 as vice-president and general manager, prior to which he had had over 30 years' experience in engineering, approximately 20 years of which was with the Studebaker Corporation. Mr. Herrmann plans to re-enter some phase of the automotive field.

Karl Herrmann

E. R. PACKER has resigned his position as mechanical engineer of the Q & C Company, New York, and has been appointed assistant to the president of The Rails Company, with headquarters at New Haven, Conn. Mr. Packer has served his apprenticeship in both shop and foundry practice and was consecutively draftsman, chief draftsman, estimator and sales engineer. He has been for a number of years identified with the railway supply business, specializing in locomotive, car, and track devices, which are now extensively used. He has had wide experience in the development of snow-fighting equipment, including snow flangers and plows, and electric heaters for railway switches and third rails. He has devoted much time to forced feed mechanical lubrication for locomotives and has contributed improvements in this field. In his association with The Rails Company, Mr. Packer will continue in the development, promotion, and sales of devices to serve the same general field with which he has been so closely associated.

Obituary

ROBERT E. BELKNAP, at one time sales agent for the Bethlehem Steel Company at Chicago, died in Boston, Mass., on June 4.

W. A. CHAMPIEUX, superintendent of the Illinois-Southern district for the Ox-weld Railroad Service Company, with headquarters at Chicago, died in that city on June 4 of heart failure.

JOSEPH DOLAR, vice-president of Templeton, Kenly & Co., Chicago, died in that city on May 30 of pneumonia. Mr. Dolar entered the employ of this company in 1906 as a draftsman, and later became works manager, purchasing agent, and in 1914 vice-president in charge of purchases.

JOHN BRUNNER, consulting engineer of the Carnegie-Illinois Steel Company, Chicago, died in Evanston, Ill., on June 15 after a long illness. Mr. Brunner was born in Sweden on November 22, 1866, and was graduated from the Royal Institute of Technology of Sweden in 1887.

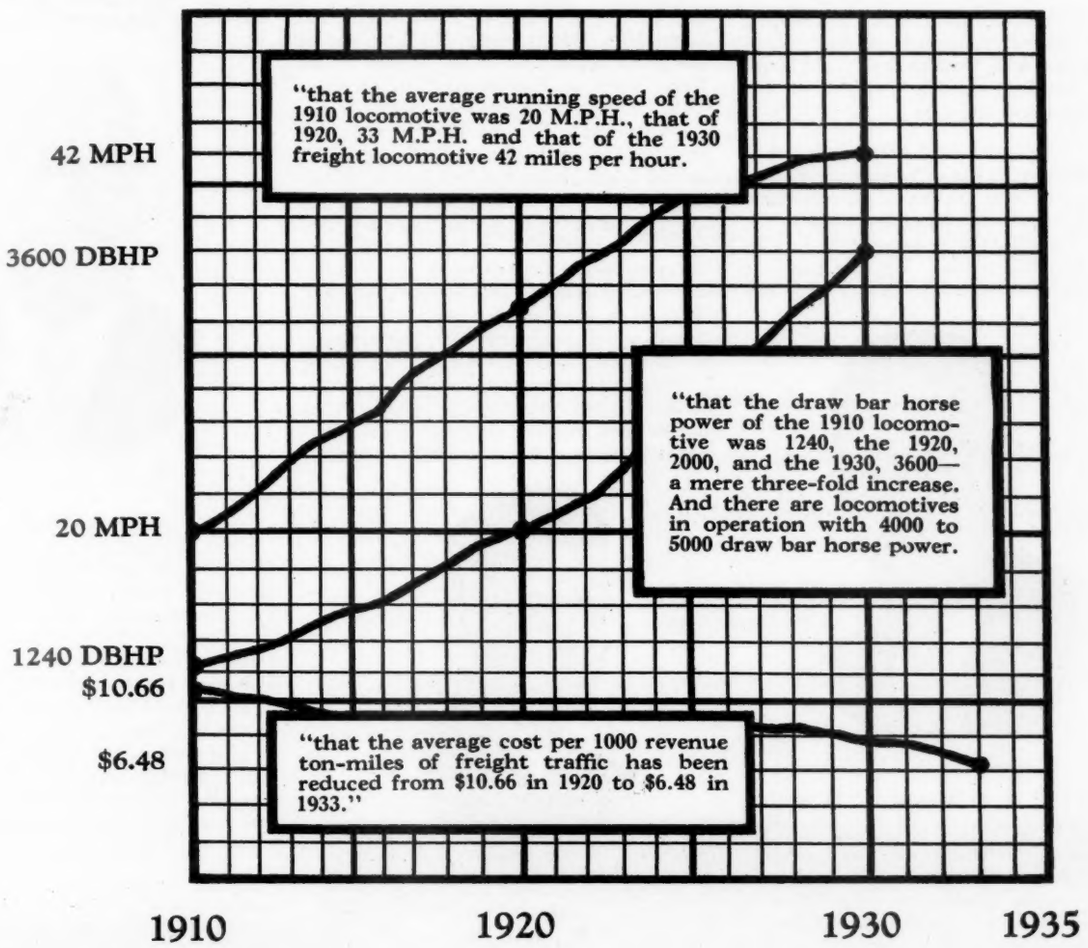
FREDERICK W. STUBBS, who was mechanical engineer of the Chicago Great Western from 1911 to 1923, died on May 16 at Muncie, Ind. From 1923 to 1926 Mr. Stubbs served as mechanical engineer of the Standard Stoker Company, and later was connected with the A. M. Byers Company. At the time of his death he was mechanical engineer of the Muncie Oil Engine Company, Muncie.

HORACE A. CROCKER, retired mechanical expert of the Westinghouse Air Brake Company, died May 27. Mr. Crocker was born in Indiana and went to California in 1882 to enter the employ of the Southern Pacific at San Francisco. After 21 years' service as a mechanic, air brake repairman and later air brake inspector, he became associated with the Westinghouse Air Brake Company as inspector at Oakland, in 1903. He was transferred to Los Angeles as representative of the Westinghouse Air Brake Company, and Westinghouse Traction Brake Company, which position he held until he retired in 1933.

(*Turn to next left-hand page*)

THE RECORD SHOWS* . . .

Speed and Horse Power go UP... Costs go DOWN


"that the average running speed of the 1910 locomotive was 20 M.P.H., that of 1920, 33 M.P.H. and that of the 1930 freight locomotive 42 miles per hour.
"that the draw bar horse power of the 1910 locomotive was 1240, the 1920, 2000, and the 1930, 3600—a mere three-fold increase. And there are locomotives in operation with 4000 to 5000 draw bar horse power.
"that the average cost per 1000 revenue ton-miles of freight traffic has been reduced from $10.66 in 1920 to $6.48 in 1933."
42 MPH
3600 DBHP
20 MPH
1240 DBHP
$10.66
$6.48
1910
1920
1930
1935

Increased draw bar horse power and improved design of modern locomotives moves heavier trains at higher speeds and at greatly reduced costs per 1000 revenue ton-miles.

Modern power is essential for economical railroading.

*L. W. Wallace, Director of Equipment Research; Association of American Railroads, before the Pittsburgh Railway Club.

LIMA LOCOMOTIVE WORKS, INCORPORATED, LIMA, OHIO

LIMA LOCOMOTIVE WORKS INCORPORATED

Personal Mention

General

W. J. O'NEILL has been appointed superintendent of motive power of the Western Pacific, with headquarters at Sacramento, Cal., succeeding M. B. McPartland.

E. R. MANOR, assistant to the general mechanical superintendent of the Northern Pacific, with headquarters at St. Paul, Minn., has had his title changed to general mechanical assistant.

D. J. SHEEHAN, mechanical assistant to the president of the Chicago & Eastern Illinois, has been appointed superintendent of motive power, with headquarters as before at Danville, Ill., to succeed L. S. Kinnaird, who has retired. Mr. Sheehan is a native of Northampton, Mass., and was

D. J. Sheehan

graduated in mechanical engineering from the University of Michigan in 1920. From the time of his graduation until 1923 he served as an instructor in the mechanical engineering department of Purdue University. He then entered the engineering department of the Lima Locomotive Works, Lima, Ohio, where he remained until 1928, when he entered the service of the Erie as special engineer to the mechanical assistant to the president. In July, 1929, he was appointed special engineer to the mechanical assistant to the president of the Chesapeake & Ohio, and in 1932 was appointed engineer of motive power of the Advisory Mechanical committee of the Chesapeake & Ohio, the Erie, the New York, Chicago & St. Louis and the Pere Marquette, with headquarters at Cleveland, Ohio. Later in the same year Mr. Sheehan became mechanical assistant to the president of the C. S. & I. with headquarters at Danville.

EUGENE H. ROY, whose appointment as general superintendent motive power for the Seaboard Air Line, with headquarters at Norfolk, Va., was noted in the June *Railway Mechanical Engineer*, was born on August 14, 1883, at Winooski, Vt. Mr. Roy entered railway service in November, 1905, as a machinist for the Boston & Maine at Worcester, Mass., and the following year went with the Florida East Coast, serving as a machinist at St. Augustine, Fla. In August, 1907, he became a machinist for the Seaboard Air Line at Jacksonville, Fla., serving successively with that road as night enginehouse foreman at Jacksonville, general foreman at Tampa, Fla., and enginehouse foreman at Raleigh, N. C., and at Portsmouth, Va. From May, 1918, to June, 1919, he was in charge of machinists in the United States Navy Yard at Portsmouth. In October, 1919, he became enginehouse foreman for the Virginian at Elmore, W. Va., and from April to August, 1920, was leading machinist and salesman for the Union Iron Works at Berkley, Va. In August, 1920, he reentered the service of the Seaboard Air Line as a machinist at Portsmouth, then becoming general foreman in the locomotive department at Portsmouth. In April, 1922, he became master mechanic at Savannah and in February, 1927, general master mechanic, Western district. On March 1, 1928, he became master mechanic, which position he held successively on the Alabama division, the Alabama and East Carolina division and the South Carolina division. On September 6, 1929, Mr. Roy was appointed superintendent motive power at Savannah and on April 1, 1931, was appointed assistant general superintendent motive power.

Eugene H. Roy

P. J. COLLIGAN, general superintendent of motive power of the Chicago Rock Island & Pacific, with headquarters at Chicago, at his own request, has been relieved of the responsibilities of this position but will continue to serve the railroad in a consulting capacity. Mr. Colligan was born on January 24, 1868, at Rock Island, Ill. He first entered railway service with the Rock Island in 1886 as a call boy, later becoming a machinist apprentice. On finishing his apprenticeship in 1890 Mr. Colligan entered the service of the Chicago, Milwaukee, St. Paul & Pacific as a machinist at Savanna, Ill., returning to the Rock Island as a machinist at Horton, Kan., in 1892. He left the Rock Island in 1894, becoming a machinist on the Missouri-Kansas-Texas and subsequently being promoted to general foreman. In 1899 he returned to the Rock Island as a machinist at Davenport, Iowa, and in the following year was promoted to the position of enginehouse foreman, in which capacity he served at various points. In 1904 he became general foreman on the Illinois Central, later being appointed master mechanic at Clinton, Ill. In 1905 he again returned to the Rock Island as machine-shop and gang foreman at Silvis, Ill.,

P. J. Colligan

in 1906 being sent to Chickasha, Okla., as general foreman. In 1907 he was appointed assistant master mechanic at Fort Worth, Tex., and in 1909, master mechanic at Dalhart, Tex. In 1923 Mr. Colligan was appointed superintendent of motive power at El Reno, Okla.; in 1925, was assigned to the position of superintendent of shops at Silvis; on March 1, 1932, was appointed superintendent of motive power at Kansas City, Mo., and on October 1 of the same year, general superintendent of motive power at Chicago.

M. B. MCPARTLAND, superintendent of motive power of the Western Pacific, at Sacramento, Cal., has been appointed general superintendent of motive power of the

M. B. McPartland

Chicago, Rock Island & Pacific, with headquarters at Chicago, Ill., succeeding P. J. Colligan, retired. Mr. McPartland, was born on October 3, 1882, at Burlington, Iowa. He received his higher education at

(*Continued on next left-hand page*)

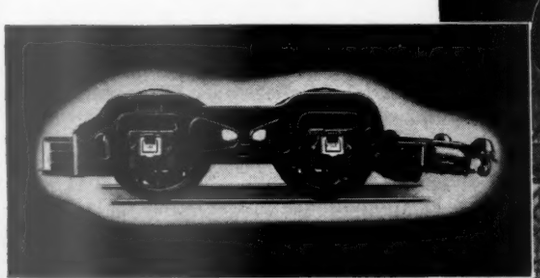
MAKE THOSE OLDER LOCOMOTIVES

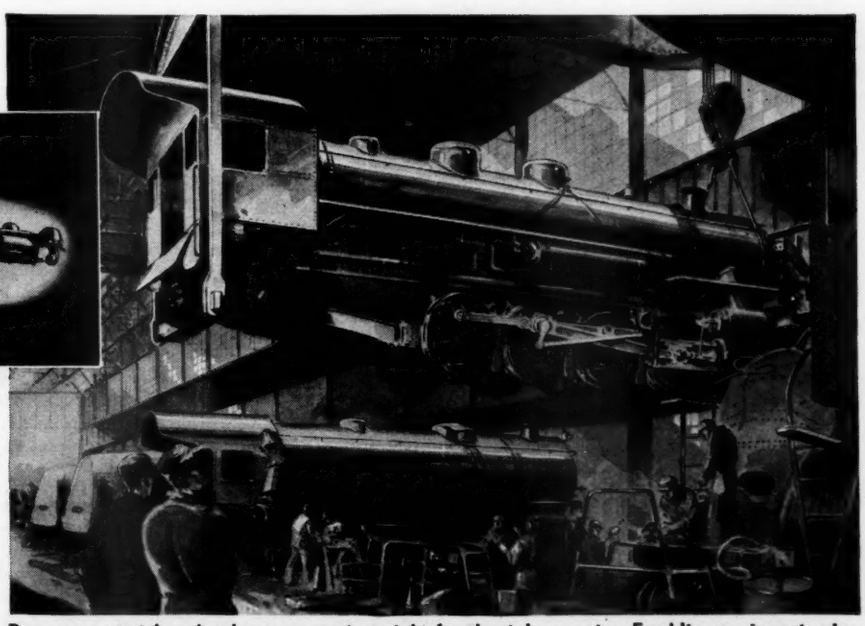
Less Costly TO MAINTAIN!

THERE is a simple way to reduce maintenance costs of power built a few years ago. By application of The Locomotive Booster the excessive stresses and shocks incident to starting, acceleration and over the "tight places" are avoided.

The added power provided by the Booster smoothly starts the train and quickly accelerates it to road speed without excessive piston thrust from the main cylinders and without the shocks and jars of taking slack.

It provides a better balanced locomotive. It reduces stresses on rods and bearings with a correspondingly reduced cost for total locomotive maintenance.





Because material and tolerances are just right for the job, genuine Franklin repair parts give maximum service life.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO MONTREAL

Purdue University, graduating in 1905. Shortly thereafter he became a special apprentice with the Chicago, Burlington & Quincy, and in 1907 he entered the service of the New York Central as gang foreman in the West Albany (N. Y.) shops. Two years later he became a draftsman on the Rock Island, and in 1910 went with the National Railways of Mexico as mechanical engineer, returning to the service of the Rock Island in 1913 as general foreman in the mechanical department at Cedar Rapids, Iowa. Two years later he was transferred to the Forty-Seventh Street shops, Chicago, and after a short time in this position, was appointed master mechanic at Goodland, Kan. In 1917 he left the Rock Island to become master mechanic of the Denver & Salt Lake, later becoming superintendent of motive power. In 1921 he left the Denver & Salt Lake to become superintendent of motive power of the Western Pacific.

Master Mechanics and Road Foremen

P. R. FRISBEE has been transferred as road foreman of engines from Buffalo, N. Y., to the Allegany and Bradford divisions of the Erie, with headquarters at Salamanca, N. Y.

LAWRENCE VAN SCHAICK has been transferred as road foreman of engines from Salamanca, N. Y., to the New York division of the Erie, with headquarters at Jersey City, N. J.

G. P. TRACHTA, master mechanic of the Chicago, Burlington & Quincy at Galesburg, Ill., has been transferred to the St. Joseph division, with headquarters at St. Joseph, Mo.

W. E. BECK has been appointed road foreman of engines of the Mahoning division of the Erie, with headquarters at Cleveland, Ohio, succeeding J. J. McNeill, retired.

C. E. PLOTT, road foreman on the Galesburg division of the Chicago, Burlington & Quincy, has been appointed assistant master mechanic of the Galesburg-Ottumwa divisions, with headquarters at Galesburg, Ill.

Shop and Enginehouse

H. K. LESURE, master mechanic of the Long Island Railroad at Richmond Hill, N. Y., has been appointed general foreman, maintenance of equipment department, New York Division.

A. L. PORTER, gas engine expert of the Chicago Great Western at Oelwein, Iowa, has been appointed supervisor of internal combustion engines, with headquarters at Oelwein.

W. L. GORTON, district road foreman of engines and fuel supervisor of the eastern district of the Erie, with headquarters at Jersey City, N. J., has been appointed supervisor of fuel and locomotive operation of the Erie, succeeding J. E. Ingling, deceased.

Car Department

J. GRANT, car foreman of the Canadian National at Dauphin, Man., has retired.

C. R. STOKES, car foreman of the Canadian National at Brandon, Man., has been transferred to the position of car foreman at Atikokan, Ont.

J. LAMBERT, car foreman of the Canadian National at Redditt, Ont., has been transferred to the position of car foreman at Brandon, Man.

C. A. ABBOTT, district car foreman of the Canadian National at Edmonton, Alta., has been transferred to the position of car foreman at Edmonton, North.

J. W. WANT, car foreman of the Canadian National At Atikokan, Onf., has been transferred to the position of car foreman at Dauphin, Man.

C. G. MORRIS, car inspector of the Canadian National at Dauphin, Man., has been promoted to the position of car foreman at Redditt, Ont.

ZOEL D. CORMIER, leading coach carpenter of the Canadian National at Moncton, N. B., has been appointed assistant foreman of the car shops at Moncton.

C. D. BROWN, car foreman of the Canadian National at Edmonton North, Alta., has been transferred to the position of district car foreman, with headquarters at Edmonton.

Purchasing and Stores

J. K. MCCANN, chief clerk of the Chicago, Burlington & Quincy, at the Havelock (Neb.) store, has been appointed inspector of stores at Chicago.

VICTOR J. DANIELS has been appointed division storekeeper on the Southern at Meridian, Miss.

G. A. GOERNER, purchasing agent of the Colorado & Southern (a unit of the Burlington System), has been appointed general storekeeper of the Chicago, Burlington & Quincy, with headquarters at Chicago.

Obituary

W. J. ORMSBY, master mechanic on the Illinois Central at Freeport, Ill., died suddenly on June 26 of a heart attack, while attending a conference of officers of the railway at Chicago.

J. G. WARNECKE, division storekeeper of the Markham storehouse (Chicago) of the Illinois Central, who had been on a leave of absence since late in 1935, died at the Illinois Central hospital at Chicago on June 19. Mr. Warnecke had been a patient at the hospital since he underwent an operation on May 25.

W. G. BLACK, vice-president in charge of purchasing, stores and mechanical matters of the Chesapeake & Ohio, the New York, Chicago & St. Louis and the Pere Marquette (the Van Sweringen Lines) with headquarters at Cleveland, Ohio, died on June 20 at the Lakeside hospital in Cleveland, after an illness of two months. Mr. Black had been connected with the various units of the Van Sweringen Lines for about 37 years. He was born on April 19, 1877, at Lima, Ohio, and after a public school and business college education entered railway service in 1893 as a machinist apprentice at the Stony Island (Chicago) shops of the Nickel Plate. Four years later he left railway service to continue his education at Armour Institute of Technology, Chicago, where he took a post graduate course in mechanical subjects. After the completion of his studies he returned to railway service as a machinist at the Burnside (Chicago) shops of the Illinois Central, and from 1900 to 1903 was employed at the South Chicago plant of the Illinois Steel Company (now part of the Carnegie-Illinois Steel

W. G. Black

Company), then returning to the Nickel Plate as a machinist. Subsequently he became machine shop foreman, and in 1904 was promoted to enginehouse foreman at Fort Wayne, Ind. On January 1, 1909, he became master mechanic at the Stony Island shops, where he remained until February, 1923, when he was appointed superintendent of motive power of the Nickel Plate and Lake Erie & Western districts of the Nickel Plate, with headquarters at Cleveland. On January 1, 1927, his jurisdiction was extended to include the entire Nickel Plate system, and in the following month he left this company to go with the Erie as mechanical assistant to the president, with headquarters at Cleveland. He remained with the Erie until 1929 when he became mechanical assistant to the president of the C. & O. Subsequently his jurisdiction was extended to include the Pere Marquette. In 1931 he was appointed assistant vice-president of the C. & O. and the Pere Marquette, with jurisdiction over purchases and stores matters. In March, 1933, he was appointed also to the same position on the Nickel Plate, and on April 17 of the same year was appointed vice-president of these roads in charge of purchasing, stores and mechanical matters. At the time of his death Mr. Black was vice-chairman of Division V—Mechanical, Operations and Maintenance Department, Association of American Railroads, to which he was elected at the 1935 annual meeting. His name had been placed in nomination for the chairmanship of this organization to be voted on at the annual meeting held at Chicago June 25 and 26. Mr. Black was also a member of the General committee of the Purchases and Stores division, A.A.R., past president of the Western Railway Club (1927-1928), and vice-president of the International Railway Fuel Association (1928-1935).